CATALOGUE

OF

X-Ray Apparatus, Electro-Medical Apparatus

and Allied Apparatus of every description.

MANUFACTURED
BY

THE CAVENDISH ELECTRICAL CO.,

— LIMITED. —

Offices, Demonstration Rooms and Workshops,
130, GREAT PORTLAND STREET,
LONDON, W.

TELEGRAMS: "MILLIAMP, LONDON."
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Managing Directors { A. R. WINTERSON.
E. H. WILLIS.

Manager:
E. J. BRADBROOKE.

1912

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THE BISHOPSGATE PRESS, E.C.

PREFACE.

In issuing this edition of our General Catalogue we have not desired to crowd as much as possible into it, but to the contrary have endeavoured to eliminate all unnecessary appliances which are merely modifications of others. Certain appliances are made in a great multiplicity of pattern without object, and we have selected those types which our past long experience has taught us to be the best of their respective classes. These we are manufacturing as our standard lines.

In regard to X-Ray Apparatus, we are confident that our Intensified Coils, our Centrifugal Motor Mercury Interrupter, our Switchboards, &c., are the most efficient that science has yet produced, but other goods such as Focus Tubes, &c., are, of course, manufactured by firms specialising entirely in their production, and we have therefore included in our Catalogue many notable products of other houses. Our customers may thus select an outfit including various appliances of other makers, but the Coil, Interrupter and Switchboard must always be the speciality of one manufacturer, because highest efficiency is only possible when these appliances are specially constructed to suit one another on certain clearly defined lines. This subject is dealt with very fully in the reading matter at the commencement of the X-Ray section.

Our principals have devoted themselves entirely to the manufacture of X-Ray and Electro-Therapeutic Apparatus for 10 years past, keeping right up-to-date and progressing by the kind co-operation of their many Medical friends. Every branch of the subject has been closely studied and every branch comes within the sphere of our business. Our principals are known to the Profession throughout the whole world, and we shall always be happy to give references to Medical men who will bear independent testimony as to the high class of our goods, and as to the manner in which our business is conducted.

Having a staff of expert mechanics and electricians on the premises, all orders are executed under direct personal supervision, an essential condition when manufacturing appliances of such a nature and for such important purposes.

Advice, information and estimates are submitted free of charge and assistance rendered in any manner whatsoever. We have every facility by reason of modern plant and experienced workmen for turning out goods of the highest class that shall give complete satisfaction, and anyone dealing with us may rely upon receiving same.

THE CAVENDISH ELECTRICAL CO., Ltd.

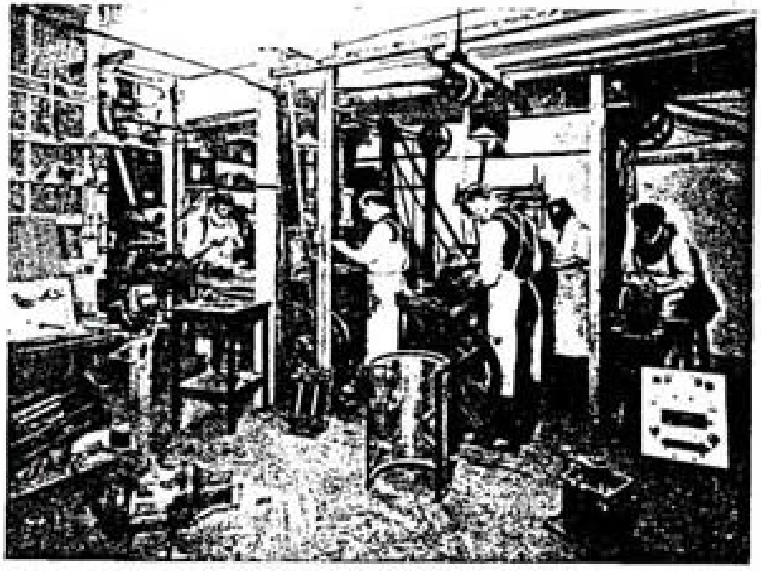
Managing Directors A.R.Winterson
E.H.Willis

Manager, E. J. Bradbrooke

THE CAVENDISH ELECTRICAL Co

ENTRANCE TO DEMONSTRATION ROOMS AND OFFICES, 130, GT. PORTLAND STREET, LONDON, W.,

Opposite New Cavendish Street, 5 minutes from Oxford Circus.



VIEW OF ONE OF THE WORKSHOPS (MACHINE ROOM)

Terms.

GUARANTEE. We guarantee all our appliances for a period of one year, undertaking to repair or replace free of charge any defective appliance, such defect arising from imperfect material or workmanship. Goods that deteriorate, even with fair use, such as Cells, Connecting Cords, Electrodes, Focus Tubes, Interrupters, &c., are not included in such guarantee.

ORDERS. When ordering any apparatus, or when making any enquiries respecting any apparatus, please state if the main be Continuous current or Alternating current and the Voltage. In the case of Alternating current we require to know the Periodicity as well as the Voltage.

In the case of those Order Numbers where alternatives or modifications are offered, kindly state requirements: otherwise in general the Order Number is all that is necessary.

PACKING. Cases and packing are charged extra, at cost price, but two-thirds will be credited on all empties invoiced at over 5 0 for one package, provided that the empty be returned in good condition, carriage paid. Packing is carefully done in all cases, but delivery is at risk and cost of customer.

REPAIRS. Repairs are carried out with the utmost promptitude on the premises by an expert staff of mechanics and electricians. Every description of apparatus, and of any make, is undertaken with equal facility and at most moderate charges. **BATTERIES** returned for re-charging are sent back within two hours of receipt.

SECOND-HAND GOODS. Second-hand apparatus of every description can always be supplied. A considerable amount is always on hand from replacements, exhibitions, &c. Quotations and particulars gladly furnished on request, and **ALL** second-hand apparatus guaranteed in perfect working order and condition.

REMITTANCES. The prices stated in this List are subject to a Discount of 5 per cent. in consideration of Cash with order or on delivery. Otherwise they are strictly Net.

FOREIGN ORDERS. Foreign orders from unknown customers must be accompanied by cash to not less than 25 per cent. of the value, unless references are given to London Agents, Bankers, Shippers, &c., and balance must be paid on delivery of the goods. In the absence of specific instructions we shall only use zinc-lined cases for damageable goods according to our own judgment.

INSTRUCTIONS. Carefully prepared sketches and carefully worded instructions are sent with every apparatus, enabling anyone to fit them up and work them to best advantage. Advice and information will always be gladly furnished respecting the various methods of application, &c., quite over and above the merely technical instructions, when so desired.

EXPERT REPRESENTATIVES will be sent to any part of the world to undertake the erection of appliances and to instruct in their management.

HIRE OF APPARATUS. Every description of apparatus, large or small, with one or two exceptions, may be hired, the price depending upon the apparatus and the hire period. Terms on request.

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(Detailed Index at end of Catalogue.)

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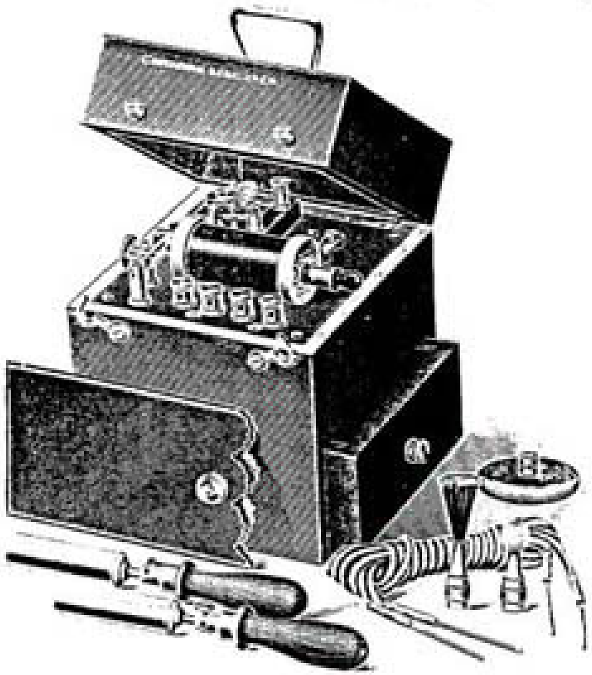
Faradic Batteries and Coils.

Faradic batteries and coils are made in an endless variety of patterns, but they all work on the same principles. The batteries and coils we now list are the latest improved patterns of the types most generally in use and that have proved the most efficient, convenient and reliable. For these reasons they are recommended, but we can always supply any other patterns or parts.



Faradic Battery, by Dr. Spamer.

This is a very convenient and efficient battery and quite the best of the low priced ones. Of sound construction, light and compact.

Provided with four terminals, two for secondary current, two for primary current, the former being much stronger than the latter. By merely sliding a little metal tube in and out of the coil, perfect gradual regulation of both currents is obtained from very weak to very strong. A crank switch "on" and "off" is provided and the battery is operated by a dry cell of large size, No. 142.

The box is of walnut, highly finished, with plated handle and hook fasteners. Drawer for accessories. Including a pair of silk covered cords, a pair of polished wood handles, two pad electrodes of different sizes, one tinsel brush electrode, and one button electrode.

Order No.

100 Size 5 in. × 5 in. × 6 in. high £1 5 0

Faradic Battery, by Dr. Spamer.

This battery is of a little more elaborate design than the above, with a separate interrupter. It is also fitted with an additional little crank switch for directing either primary or secondary current to the same terminals, obviating the necessity of changing the wires over when desiring to pass from one current to the other.

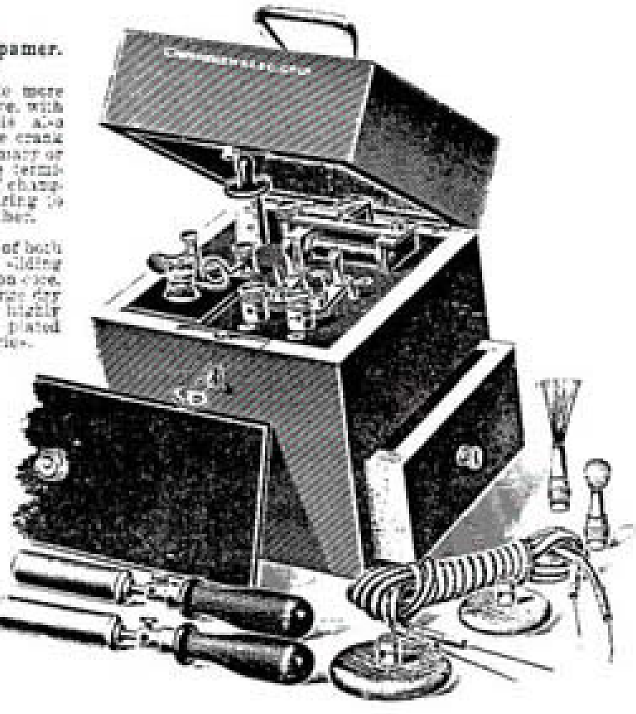
Perfect gradual regulation of both currents is effected by simply sliding up and down the graduated iron core. With on and off switch and large dry cell, No. 142. Box of walnut, highly finished, with lock and key, plated handle and drawer for accessories.

Including accessories as above, with one extra pad electrode.

Order No.

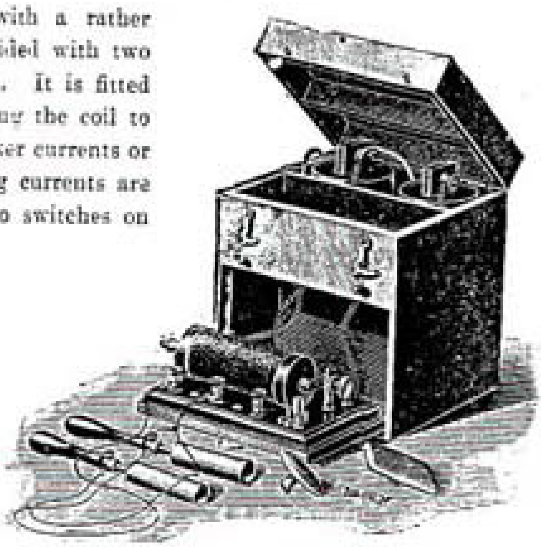
[illegible] Size 5 in. × 5 in. × 5 in. high £1 18 0

[illegible]



Faradic Batteries and Coils.

Eros Faradic Battery.

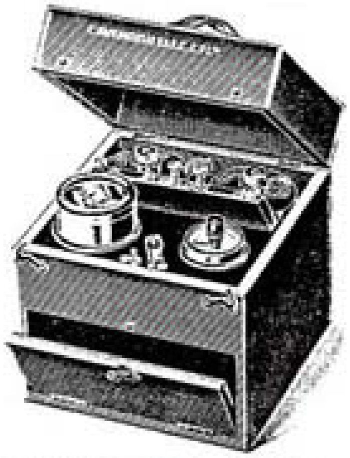


This battery is provided with a rather larger induction coil and is provided with two extra large dry cells (No. 2420). It is fitted with a little crank switch, enabling the coil to be worked with one cell for weaker currents or with both cells when very strong currents are required. The same switch also switches on and off.

Three terminals are provided, the centre and one outside one, for secondary current and the centre with the other outside one for primary current. Perfect gradual regulation of both currents is effected simply by sliding in and out of the coil a nickel-plated tube.

The box is of highly polished walnut, with handle, hook fasteners and compartment for accessories. Including accessories as No. 102.

Order No.
104 ... ... **£1 18 0**



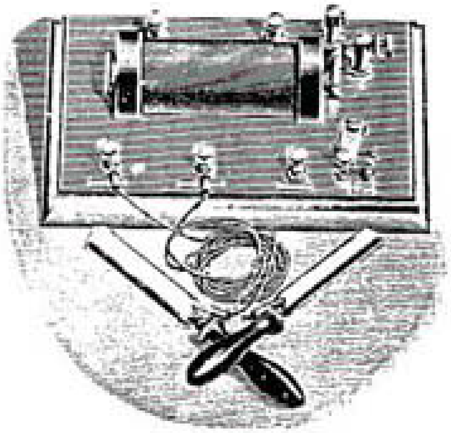
Faradic Battery, with separate interrupter enclosed in case with glass top. With three terminals providing primary and secondary current. In this battery a perfect regulation of either current from very weak to very strong is effected by turning the little milled ebonite handle round the circular scale. This handle also switches the current on, and ensures that the battery is always started with the weakest current, thus guarding against a mistake. It works with two extra large round dry cells (No. 2420) the same as the Eros.

Contained in highly finished wood case, with leather handle, hook fasteners and compartment for accessories. Including accessories as No. 102.

Order No.
106 ... ... **£2 0 0**

Full instructions for working are sent with each Battery.

Faradic Batteries and Coils.



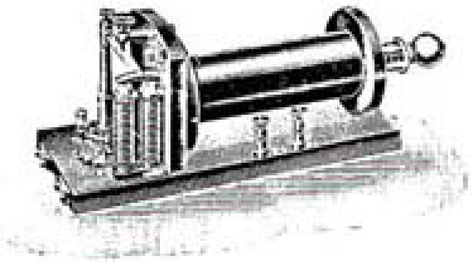
Simple Induction Coil for Faradisation, mounted on polished walnut base with moulded edge, lacquered fittings. With 3 terminals, giving primary and secondary currents. With nickel-plated draw-tube for regulation of strength. Including a pair of conducting cords, a pair of polished wood handles, and a pair of plated metal tubes.

Order No.		s.	d.
108	... ...	9	0
116	**Same,** with "on" and "off" switch (Fig.)...	10	6

Works with any dry or wet cell.

Special Coil for Hydro-Electric Baths.

Primary Current only.



This is a large and powerful induction coil, especially for hydro-electric baths, though equally useful and efficient for all other work. It is made to give only primary current because it is known to be of greater value for electric water baths than is the secondary current. It is mounted on a polished walnut base and fitted with a little crank switch and six studs for bringing into use different layers of the windings. In this way six different degrees of strength are obtainable between extreme limits, and each different strength can of itself be gradually regulated from weak to strong by simply moving in and out the graduated iron core.

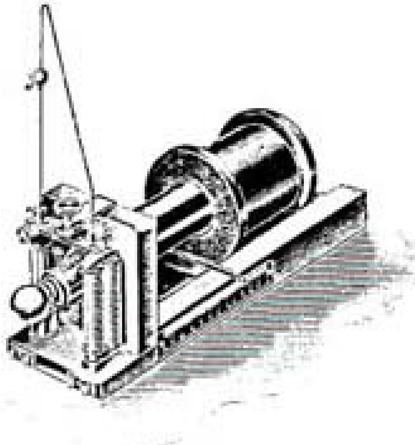
The coil is covered with polished black celluloid and is of best make and finish in every detail. Size of base 9 in. × 3 in.

Order No.				
120	(Fig.	£2	10	0
124	**Same,** but fitted with special interrupter enabling very slow interruptions to be obtained when desired. Illustrated and described on next page...	£2	15	0

This coil works with one or two dry or wet cells, or from the main if suitably arranged. (See page 42.)

Faradic Batteries and Coils.

Sledge Coils.



No. 132.

Sledge Coil, after **Dubois-Reymond.**

This is a large and powerful coil of the very highest class. It provides primary and secondary currents, with sliding graduated iron core for perfect regulation of the former, and with sliding secondary coil for perfect regulation of the latter. The iron core also controls the strength of the secondary and is used in conjunction with the sliding coil.

Mounted on highly-finished walnut base, with a mm. scale engraved on celluloid. Fittings nicely lacquered. Coil covered polished black celluloid and the whole of the highest class make and finish.

Order No.		
130	**With Special Interrupter**, as illustrated, with adjustable balance weight and tension spring, permitting regulation of the rapidity of the interruptions from very slow to very fast (Fig.)	£2 15 0
134	**With Ordinary Interrupter,** without balance weight and tension spring arrangement. This interrupter can be regulated to a certain extent, but really slow interruptions cannot be obtained	2 10 0
138	As No. 130, but sliding secondary coil, operated by a strong **rack and pinion movement,** with milled ebonite handle and nicely lacquered brass fittings	3 5 0
142	As No. 134, but with rack and pinion movement	3 0 0

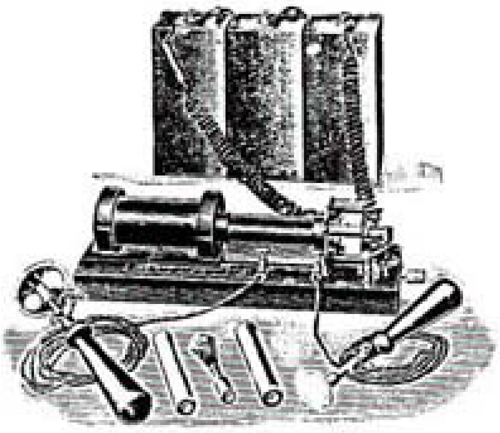
The rack movement allows of a more gradual and smooth regulation of the current than it is possible to obtain by sliding the secondary coil by hand.

Order No.		
150	**Sledge Coil,** after **Dubois-Reymond,** mounted up in highly-polished walnut or mahogany box, with 2 large best quality dry cells. With crank switch, giving primary and secondary currents at same two terminals. Box fitted with drawer for accessories, with handle and lock and key, &c.	
	Including a pair of silk-covered cords, a pair of polished wood handles, and six assorted electrodes ... ... extra	£1 15 0

All above work with one or two dry or wet cells. For same coils working from main, see page 42.

Faradic Batteries and Coils.

Sledge Coils.



Sledge Coil by Dr. Hovent.—This coil is fitted with a unique interrupter, enabling the rapidity of the interruptions to be regulated from extreme slow (about 80 per minute) to extreme fast (1,500 or more per minute) by simply turning a little milled handle to the desired extent. No other adjustments, balance weights or tension springs to alter in any way.

The paddle of the interrupter rotates under magnetic attraction, and in doing so acts against a hair spring. By turning the milled handle it is possible to control exactly the extent of the swing of the paddle, and thus the rapidity of the interruptions can be most accurately adjusted between absolute extremes, by infinite degrees.

The coil provides primary and secondary currents. The secondary coil is gradually moved over the primary by a little milled handle and threaded rod, giving very fine gradual regulation of the strength. The secondary coil is fitted with a little pointer moving over a mm. scale on celluloid. The primary current is controlled by means of a little crank switch and studs, allowing six different degrees of strength by varying the windings in use.

The interrupter is enclosed in a brass and clear celluloid case. The whole mounted on a finely polished walnut base, 11 ins. long by 3½ ins. wide. Metal fittings finely lacquered. Of best make and finish in every detail.

Order No.		
154	... ...	£4 10 0
156	**Same.** but mounted in highly finished oakwood or walnut box with 3 large dry cells	6 5 0

The Hovent coil works with 1, 2 or 3 dry or wet cells, the number used permitting further control of the rapidity of the interruptions.

Milli-Amperemeters.

We only supply the highest class of milli-ammeter, viz., those of the **D'Arsonval moving-coil dead-beat precision type.** These instruments are now universally taken on all switchboards, batteries, &c., and are fitted to all our best appliances, such as the Universal machine, page 108, &c. No one ever considers the purchase of instruments of the old type which could only be used in one position, and in general had a number of disadvantages.

The D'Arsonval instruments can be used in any position with perfect accuracy. They are independent of electrical fields, magnets, and the earth's magnetism. The readings are accurate and the needle is dead-beat, that is to say, it swings to a certain point in response to the amount of current circulating, and there remains still; it does not swing backwards and forwards before coming to rest as is inevitably otherwise the case with all cheap or inferior instruments.

The range of milli-ammeters we offer will be found to meet all requirements. They are of two sizes, and with one, two, and three readings, and have been made each to fulfil some definite purpose, and not merely assorted in a haphazard manner.

The principle of a shunt, as adopted in some of the instruments, is that of giving the current another course through the instrument besides its normal course, and the two are so adjusted that $\frac{9}{10}$ths of the current traverses the shunt $\frac{1}{10}$th the normal circuit influencing the needle. It follows, therefore, that the needle is only moved by $\frac{1}{10}$th of the current actually circulating, so that its indication requires to be multiplied by 10 in order to arrive at the actual milli-amperage being administered to the patient.

Thus one instrument is made to serve the purpose of two or three instruments with different scales, so that a reading can be chosen which will indicate the particular current it is intended to treat with to the best advantage. For instance, take the milli-ammeter reading 0–15 m.a. normal, and 0–150 m.a. by shunt. If desiring to treat a sensitive area such as the head or internally, &c., it would be desired to administer just two or three milli-amperes. On the low reading the needle would move $\frac{1}{5}$th of the distance across the scale, and would indicate clearly the current circulating. On the high reading 3 m.a. would only represent $\frac{1}{50}$th of the distance of the total scale (150 m.a.), and therefore it would hardly move at all, and it would not be possible to tell what current was passing.

On the other hand, the next patient may require 50 or more milli-amperes, as with ionic medication, and in such case the high reading comes into use since the low reading cannot be used to measure more than 15 m.a.

Milli-Amperemeters.

For measuring Galvanic Current.

D'Arsoval moving-coil, dead-beat precision type. Of the highest class, with finely lacquered brass cases. Clear, distinct scales, equally divided over the whole range.

50
Milli Amp.

This is a large instrument, 4½ in. diameter, with 3 readings. The low reading 0-5 m.a. indicates each fifth part of a milli-ampere, and is for accurate measurement of weak currents as used when treating the head, internally, &c. The middle reading 0-50 m.a. is for general galvanisation, ionic medication and electrolysis, each division of the scale representing 2 m.a. The high reading, 0-500 m.a. is for strong currents. Up to 150 m.a. are required for large areas treated by ionic medication, and much stronger currents still are used for full hydro-electric baths.

The milled ebonite knob is for changing the readings, and the reading actually in use is indicated automatically by a figure, 5, 50 or 500 in the centre of the dial.

Order No.				
160	As described, with right and left readings	£3	5	0
164	**Similar Instrument, 4½ in. diameter, with 2 readings,** viz., 0-15, 0-150 m.a., with right and left readings	3	0	0
168	**Same Instrument as No. 164,** but with reading right across scale instead of right and left readings	3	0	0

The Instrument No. 160 is fitted to our Universal Apparatus listed on page 106, and is essential for full hydro-electric baths. It fulfils all requirements, and is the best milli-ammeter manufactured.

The Instrument No. 164/8 is fitted on most ionic switchboards as listed on page 41. Very strong currents, up to 120 or more milli-amperes, are considered necessary to produce the best results in ionic medication of large areas, and we are making this instrument specially to meet these conditions to best advantage.

A Similar Instrument of smaller diameter is also made for ionic batteries where space usually prevents the larger one being fitted. Illustrated and listed on next page.

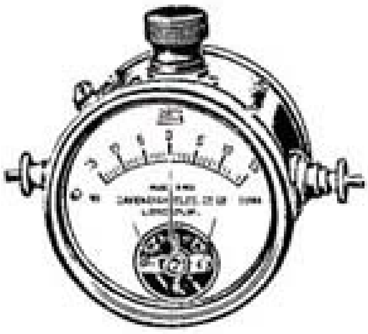
Instruments with right and left readings are very convenient when a pole reverser is used, indicating to either right or left according to position of reverser.

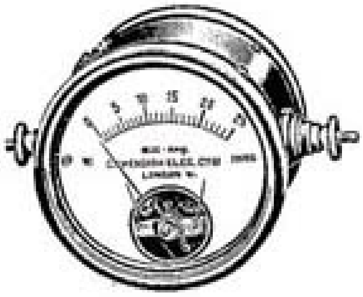
Those with scale right across offer the advantage of a more open scale. If used on a board or battery fitted with a pole reverser, they can be so placed in circuit that they will always indicate notwithstanding the reversal of the poles.

Milli-Amperemeters.

For measuring Galvanic current.

D'Arsonval moving-coil, dead-beat, precision type. Of the highest class with finely lacquered brass cases. Clear distinct scales, equally divided over the whole range.





Order No.		£	s.	d.
170	**Milli-Ammeter,** 2½ in. diameter, with two readings, viz.: 0-15, 0-150 m.a., with right and left readings	£2	4	0
174	**Same Instrument,** but with reading right across scale instead of right and left readings	2	4	0
178	**Milli-Ammeter,** 2½ in. diameter, with two readings, viz.: 0-5, 0-50 m.a., with right and left readings	2	4	0
182	**Same Instrument,** but with reading right across scale instead of right and left readings	2	4	0
186	**Milli-Ammeter,** 2½ in. diameter, with one reading, viz.: 0-25 m.a., with right and left readings	2	0	0
188	**Same Instrument,** but with reading right across scale instead of right and left readings	2	0	0

Nos. 170 and 174 are specially suitable for ionic medication batteries, &c., as explained on previous page, as also for all general work.

Nos. 178 and 182 are suitable for all general galvanisation, ionic medication and electrolysis, more especially for batteries up to about 20 cells which are not really capable of giving a greater output than 50 m.a. For ionic medication, batteries of 28 cells are considered the standard, and 32 cell batteries are frequently taken when large areas have to be treated.

For remarks regarding "right and left readings" and otherwise, see previous page.

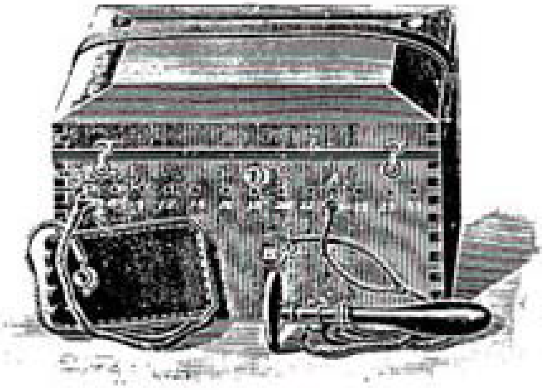
Pillars for Milli-Ammeters.

Order No.			s.	d.
190	**Finely lacquered brass pillars** to support the large Milli-Ammeters, Nos. 160 to 168, mounted on little polished wood base with two terminals for connecting the current		10	0
194	**Lacquered brass pillars only,** unmounted	pair	8	0
200	**Finely lacquered brass pillars** to support the smaller Milli-Ammeters, Nos. 170 to 188, mounted on little polished wood base with two terminals for connecting the current		8	6
204	**Lacquered brass pillars only,** unmounted	pair	7	0

As illustrated, **page 15,** &c.

Galvanic Batteries.

For Galvanisation, Ionic Medication and Electrolysis.



Galvanic Battery. **Simple Type.**

This is the simplest type of Galvanic Battery. Instead of having a cell collector, the front of the box is provided with small metal holes into which the connecting cords are plugged, thus bringing into use any number of cells desired. If only a single cord was used the circuit would be broken every time the number of cells was changed, and all the cells (perhaps 20 or more) would be brought into action at once, thus causing most unpleasant shocks to the patient. To obviate this a forked cord is supplied, this preventing the breaking of the circuit and enabling the number of cells to be gradually increased.

One branch of the forked cord must be pulled out immediately the other is plugged in. If both are left in for some seconds one or more of the cells are short-circuited and spoiled.

With best quality dry cells. Polished oakwood box with handle and hook fasteners. Well and strongly made.

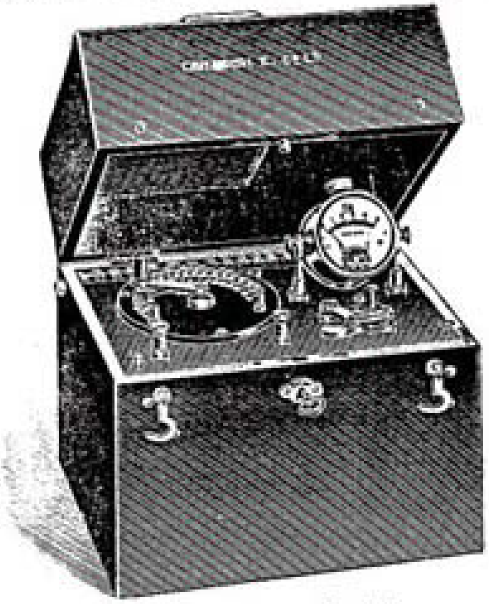
Including one pair of silk covered cords, one pair of polished wood handles, one flat-covered electrode and two circular pad electrodes.

Order No.					
210	With 8 dry cells	...	£1	12	0
212	,, 12 ,,	...	2	0	0
214	,, 18 ,,	...	2	12	0
216	,, 24 ,,	...	3	3	0
218	With 28 dry cells	...	£3	12	0
220	,, 32 ,,	...	4	2	0
222	,, 40 ,,	...	5	0	0

Galvanic Batteries.

For Galvanisation, Ionic Medication and Electrolysis.

See page 21 for Special Ionic Medication Outfits.



Galvanic Battery. Best Type.

These batteries represent the highest class of galvanic battery, nothing superior being made. They are provided with a crank collector for regulating the strength of the current gradually by bringing the cells into use one by one. This collector is mounted on a polished ebonite base, with a spring fitted to the crank to secure always a good contact and with a second spring dropping into little depressions opposite each stud, so that the crank handle is left fair and square on the top of any one stud. If left bridging across two studs, as otherwise often happens, one cell inside is short-circuited and spoiled.

The dry cells are of best quality. The box is of dark polished fumed oak, best hand made and highly finished. The whole of the very best class in every detail. *Milli-ammeter mounted on pillars.*

Prices :—Complete with a pair of silk covered cords, a pair of polished wood handles, two pad electrodes, one button electrode and one tinsel electrode :—

Order No.		£	s.	d.	Order No.		£	s.	d.
230	With 10 dry cells ...	2	15	0	250	With pole reverser ...	3	5	0
232	,, 20 ,, ...	4	0	0	252	,, ,, ...	4	10	0
234	,, 24 ,, ...	4	12	0	254	,, ,, ...	5	2	0
236	,, 28 ,, ...	5	4	0	256	,, ,, ...	5	14	0
238	,, 32 ,, ...	5	16	0	258	,, ,, ...	6	6	0
240	,, 40 ,, ...	7	0	0	260	,, ,, ...	7	10	0

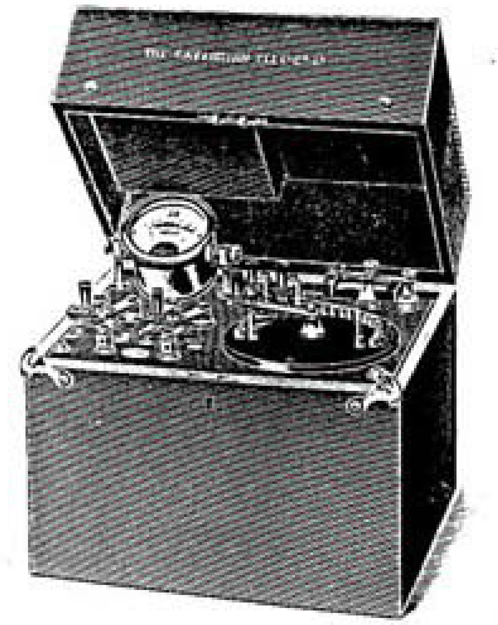
If with best D'Arsonval dead-beat, moving-coil type milli-ammeter to measure the strength of the current, either Order No. 178/182 0-5, 0-50; or Order No. 170/4 0-15, 0-150, extra **£2 4 0.**

If milli-ammeter with only one reading, 0-25, Order No. 186/8, extra **£2 0 0.**

Same batteries with double cell collector, **£1 5 0** extra for 20 and 24 cells, or **£1 10 0** extra for 28, 32 and 40.

Combined Batteries.

For Galvanisation, Ionic Medication, Electrolysis and Faradisation.



The galvanic portion of these batteries is exactly as specified on page 15, while they are provided, in addition, with a **Faradic Coil by Dr. Spamer.** Extra large dry cells are supplied for working the coil, which is of the type of O.N. 102, giving primary and secondary current. These batteries are invariably fitted with a pole reverser and with a Watteville switch. The former for reversing the direction or polarity of the galvanic current and for giving shocks to the patient for electro-diagnostic purposes, for muscle testing &c. The latter is for directing either galvanic or faradic current to the same two terminals and for combining them.

Including Pole Reverser, primary and secondary switch and complete with a pair of silk covered cords, a pair of polished wood handles, 3 pad electrodes, 1 tinsel brush electrode and 1 button electrode.

Order No.			Order No.		
270	With 20 dry cells ...	£6 8 0	274	With 28 dry cells ...	£7 12 0
272	„ 24 „ „ ...	7 0 0	276	„ 32 „ „ ...	8 4 0

Same Batteries with best D'Arsonval type, dead-beat moving-coil Milli-ammeter, either O.N. 178/182 (0–5, 0–50) or O.N. 170/4 (0–15, 0-150) ... ... £2 4 0 extra.

If Milli-ammeter with one reading only, viz., O.N. 186/8 (0-25) 2 0 0 „

If with Watteville switch, the prices increase... ... ... 0 10 0

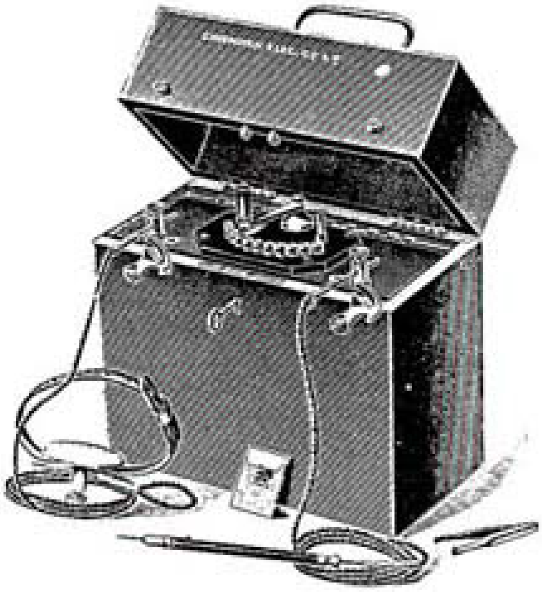
If without pole reverser, the prices reduce 0 10 0

Same batteries, with double cell collector ... ... 1 5 0 extra for 20 and 24 cells, £1 10 0 extra for 28 and 32 cells.

The Milli-ammeter is always mounted on pillars.

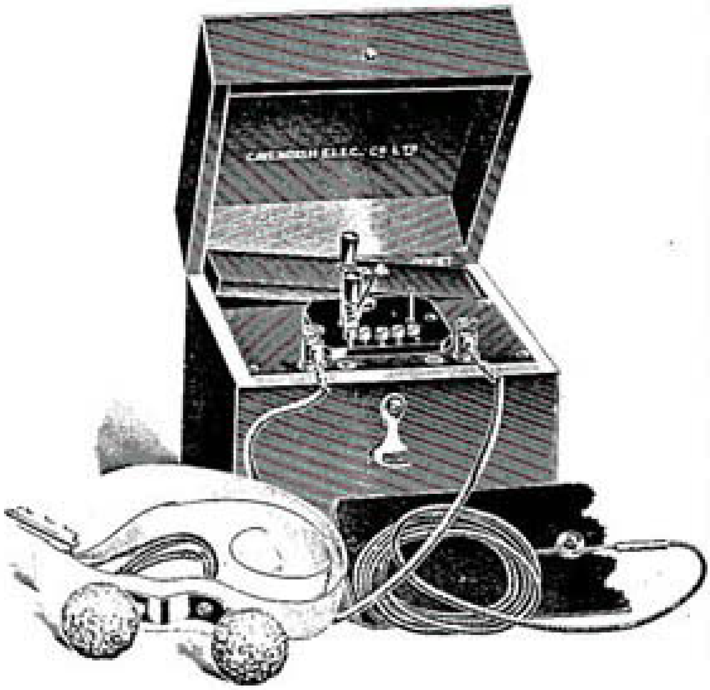
Electrolysis Outfits.

Galvanic Battery with 10 best quality dry cells, with crank collector on ebonite for bringing the cells into use one by one to regulate the strength. Box of polished oakwood with lock and key and hook fasteners: slide in lid for accessories. Handle for carrying.



Complete Outfit.

Battery as described ...	£2	9	0
Pair of cords, No. 750 ...	0	1	6
Wristlet electrode, No. 890	0	4	0
Needle holder, No. 1050 ...	0	3	6
Forceps, No. 1024	0	2	0
Packet of steel needles ...	0	0	0
Order No. 296. Complete	£3	0	0



Galvanic Battery.

By Dr. W. J. M. Ettles, specially for eye treatment.

With four best dry cells, with crank collector on ebonite for bringing the cells into use one by one to regulate the strength. Box of polished oakwood with hook fastener, handle and compartment for accessories.

Complete with a pair of cords (No. 750), one black pad electrode (No. 810) and one special double sponge electrode with webbing band for the eyes. The sponges can be adjusted at different distances apart.

Order No. 320 ... ... £1 15 0

Galvanic Batteries.

Special Outfits for

Ionic Medication.

Cataphoresis and Ionisation, between which it was at one time endeavoured by some to define a difference, are now classed under the one heading of Ionic Medication. This treatment consists in the introduction of medicaments direct to the part through the unbroken skin by the galvanic current.

Some important advantages of the method over administration of the same medicament by injection or per mouth are (1) that an even distribution of the drug takes place in the cells, (2) certainty of action on the part desired, (3) possibility of obtaining the effects wanted by a much smaller dose on account of the direct local application. Some drugs applied to the skin for absorption frequently fail to penetrate the skin at all, and others penetrate only with difficulty, whereas by the Ionic method they can be made to enter with ease and certainty into the deeper tissues.

Ions carry always a definite electrical charge. Those carrying a positive charge travel to the negative (−) pole and are called Cations (cathode—negative), while those negatively charged travel towards the positive pole (+) and are called Anions (anode—positive). In other words they are called after the pole to which they are attracted.

Thus it will be understood that the medicaments must be connected with either the positive or negative pole of the current according as to whether they carry a positive or negative charge. The direction of the current as commonly spoken about—from positive to negative—does not enter into the matter at all.

We have prepared a special Booklet, wherein the whole subject is fully dealt with, in regard to the medicaments that may be used and their polarity and the complaints that have given the best results under Ionic treatment. Most excellent results have been obtained in a variety of cases. The treatment is commanding the attention of the medical profession all over the world, and its scope will rapidly extend in the near future.

The Booklet (40 pages) is free to the medical profession, and will be found of the greatest interest and service.

Ionic Medication.

No treatment has been more universally taken up, nor given more general satisfaction. It is a treatment that appeals particularly to the general practitioner because the outfit necessary is simple and inexpensive and the administration free from all complication.

It has been found that the very best results are derived from the application of strong currents, so that batteries provided with a greater number of cells are now adopted. For this reason we have taken a 28-cell battery as our standard. A 28 or 32-cell battery will meet all requirements in regard to the larger areas, such as shoulder, &c., while a 20 or 24-cell battery will fulfil requirements in regard to the smaller joints, such as knee, and also all cases of rodent ulcer, nævi, &c.

The usual method of application is to wrap the joint round with several thicknesses of lint or other material saturated in the medicament. Over this is placed a flexible electrode in order to secure a uniform contact. This is very important, because strong currents can only be given when a large area is covered and the current is evenly diffused. Even diffusion is only possible when even contact is obtained.

Nothing is better for this purpose than the chain mail electrodes of zinc (see page 22). These can be bound in position over the lint.

In the case of small areas, the part is simply covered by a pad of lint, on which is pressed an electrode of carbon, zinc, &c. These electrodes placed on the medicament are called "active." The "indifferent" electrode requires to be of large size, in order to diffuse the current, and because the action does not require to be confined to a given area.

As already mentioned, an even uniform pressure must be maintained on large electrodes or otherwise the very object of their size is rendered void. A cell (page 26) filled with water is a very efficient and convenient arrangement. Water presses equally in all directions, so that even pressure on the limb is secured in the best manner, while, moreover, the water covers a much greater area than is possible to obtain by any solid electrode.

Ionic Medication.

In many cases the actual administration is carried out by means of the cells, the medicament being placed in one or more cells, and one or more cells being used as indifferent. In certain cases two medicaments are used, each being placed in the water of a cell (or two cells), one medicament being connected to the positive pole and the other to the negative pole; for instance pot. iodide on negative pole, with lithium on positive pole have been found to provide excellent results in cases of acute gout, &c.

The 4-cell Bath system is likewise pre-eminently the method for carrying out any form of electrisation. See reading matter, pages 110 to 116.

Realising the importance and universal adoption of ionic medication, Messrs. Burroughs Wellcome & Co. were foremost in placing on the market the following Soloids specially prepared for the purpose. One dissolved in 1 oz. (28.4 c.c.) of distilled water gives a 1 per cent. solution ready for use.

"Soloid" Products for Ionic Medication

		Per Bottle. s.	d.
"Soloid"	Cocaine Hydrochloride, gr. 4.37 [0.283 gm.]	6	5
"	Copper Sulphate " " "	0	6
"	Lithium Sulphate " " "	0	8
"	Magnesium Sulphate " " "	0	6
"	Mercury Succinimide " " "	2	6
"	Potassium Iodide " " "	0	9
"	Quinine Bisulphate " " "	0	8
"	Sodium Chloride " " "	0	6
"	Sodium Salicylate " " " ... ... *(Physiologically pure)*	0	8
"	Zinc Sulphate " " "	0	6

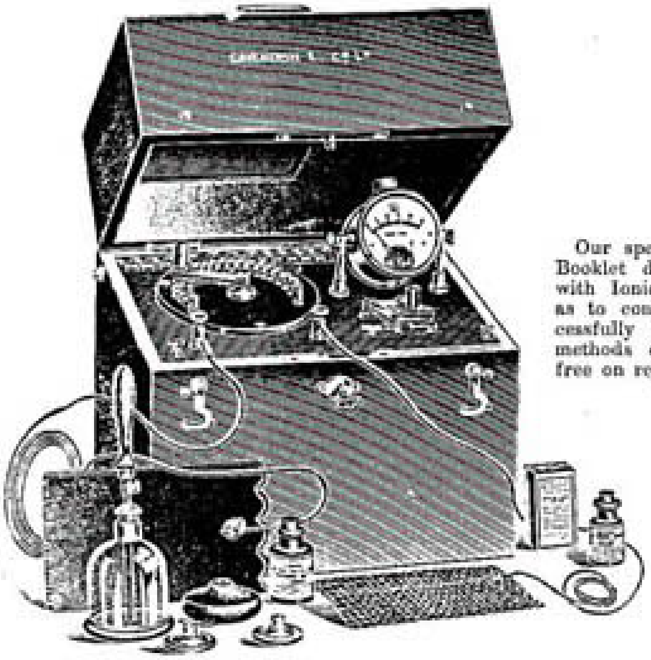
"Soloid" products for ionic medication are supplied in bottles of 25.

The solutions can be applied by saturating a pad of lint, or they may be applied by means of the cup electrodes, Nos. 400 to 412.

The above Soloids are always stocked.

Ionic Medication—Batteries.

For Universal Machine and for Switchboards working from continuous or alternating main, see pages 108 and 109, and 40-43 respectively.



Our special 40 page Booklet dealing fully with Ionic Medication as to complaints successfully treated and methods of procedure free on request.

Galvanic Battery. Special Ionic Medication Outfit.

These Batteries are exactly the same as those described on page 15, with cell collector on ebonite, with best quality dry cells, contained in polished oak case and everything of the highest class.

On account of the strong currents now being used for Ionic work, as explained on page 19, we are including a **milli-ammeter with special readings,** viz., 0–15, 0–150, which will meet all requirements. It is a D'Arsonval moving-coil instrument of the best class, dead-beat. Described fully under O.N. 170.

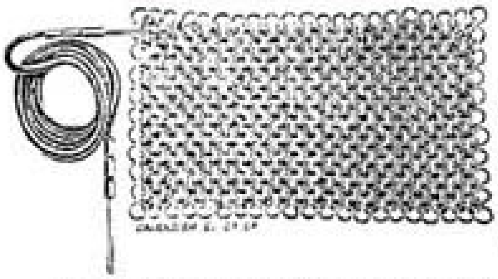
Including the following electrodes: 1 pair of silk covered cords, 1 polished wood handle, 1 zinc chain mail electrode, 1 large indifferent electrode, 1 carbon, 1 zinc and 1 copper electrodes, and 1 glass cup electrode.

Order No.			Order No.		
850	With 20 dry cells ...	£6 0 0	854	With 28 dry cells ...	£7 5 0
852	,, 24 ,, ...	6 15 0	856	,, 32 ,, ...	8 0 0

If with Pole-Reverser for changing direction of current and for giving shocks for electro-diagnostic purposes, muscle testing, &c. (as illustrated) **£0 10 0** extra.

The chain mail electrode, the carbon electrode and the indifferent electrode will serve perfectly for ordinary galvanization. The batteries can also be used for electrolysis by the addition of one or two little electrodes.

Ionic Medication—Electrodes.



Chain Mail Electrodes.

These electrodes offer the advantage of absolute flexibility. They can be wrapped completely round a joint and so afford a large and even contact surface, the importance or even necessity of which is explained on page 19.

In use they are placed over a pad of lint or other material saturated in the medicament and usually tied in position with tapes or webbing bands.

They are advised with a galvanic cable permanently soldered on, as otherwise difficulty is experienced in obtaining a good and steady contact.

They are made of pure zinc, and can be used with any medicament. The copper ones are only used with copper sulphate, &c., and not for all-round purposes.

The zinc chain electrodes also constitute excellent "indifferent" electrodes over a pad of lint saturated in plain warm water, with a pinch of salt.

Pure Zinc, with Silk Covered Cord Soldered on.

Order No.		s.	d.	Order No.		s.	d.
370	5½ in. × 3½ in.	4	9	378	9 in. × 4 in	8	3
374	7 in. × 4 in.	6	9	382	10 in. × 4½ in. ...	9	3

If without the cord the prices reduce 9d. each.

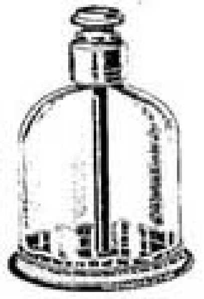
390	These electrodes are frequently taken in sets, viz.: Nos. 370, 374 and 382, with cables attached	£1	0	0

These electrodes can be made in other sizes, at proportionate prices.

Chain Mail Electrodes in Copper are supplied in same sizes as above and at same prices, but are only of use for special purposes.

Glass Cup Electrodes.

These electrodes are very convenient when treating a small area or when administering cocaine for local anæsthesia &c., particularly in conjunction with the soloid products of Messrs. Burroughs Wellcome & Co., as listed on page 20, with which they have provided most excellent results.



The electrodes are covered with pig's bladder and are fitted with an internal carbon stem to convey the current to the medicament. The lacquered brass mount is made to unscrew for filling.

The electrodes are made to screw on to handles, Page 27.

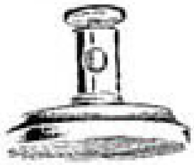
Order No.		s.	d.	Order No.		s.	d.
400	2½ in. diameter	7	6	408	1½ in. diameter	5	6
404	2 in. "	6	6	412	1 in. "	4	6

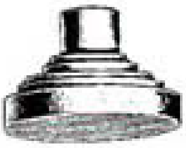
With zinc stem or zinc wire spiral, same prices.

If the pig's bladder be removed the cups can also be used by pressing into them a sponge, lint or cotton wool saturated.

When replacing the pig's bladder it should be well soaked and tied over while wet, when it will dry very taut and even.

Ionic Medication—Electrodes.





Zinc, Copper and Carbon Electrodes.

These smaller electrodes are used over a pad of lint or other material when treating small areas, the zinc especially with zinc sulphate for ulcers, nævi, &c., the copper with copper sulphate for ringworm &c., and the carbon, being non-corrosive, with any medicament.

Made to screw on handles, Page 27.

Diameter.	Order No.	Zinc.	Order No.	Copper.	Order No.	Carbon.
⅛ in.	430	1.0	450	1.3	470	1.0
¼ in.	432	1.0	452	1.3	472	1.0
½ in.	434	1.3	454	1.6	474	1.3
¾ in.	436	1.6	456	1.9	476	1.6
1 in.	438	1.9	458	2.0	478	1.9
1½ in.	440	2.3	460	2.6	480	2.3
2 in.	442	2.9	462	3.0	482	2.6

If required with a terminal to receive cable direct, instead of screwing on to the handles, place the letter "a" after Order No.

Square Carbon Electrodes.

Order No.	Size.	s.	d.	Order No.	Size.	s.	d.
500	1 in. × ¾ in.	1	0	508	2 in. × 1½ in.	2	0
504	1½ in. × 1 in.	1	6	512	2½ in. × 1½ in.	2	6

Pure Zinc and Copper Sounds.

Covered with a sliding insulating sheath of gum elastic. Finely smoothed and finished. Made to screw on usual galvanic handles as on page 27. If made to fit handle No. 2060 they are 6d. cheaper.

Straight: can be bent as desired.

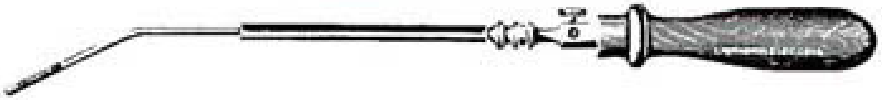
Order No.	Diameter.	Zinc. s.	Zinc. d.	Order No.	Copper. s.	Copper. d.
530	2 mm.	3	6	540	3	6
534	3 mm.	3	9	544	3	9
538	5 mm.	4	0	548	4	0

Curved End, similar to illustration next page.

Order No.	Diameter.	Zinc. s.	Zinc. d.	Order No.	Copper. s.	Copper. d.
560	2 mm.	3	6	570	3	6
564	3 mm.	3	9	574	3	9
568	5 mm.	4	0	578	4	0

If so ordered the ends can be roughed so that cotton wool saturated in medicament may be twisted round.

Ionic Medication—Electrodes.

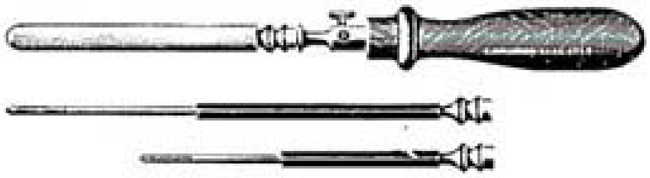


Intra Uterine Sounds of Copper. With sliding insulating sheath of gum elastic. Made to screw on ordinary galvanic handles. The ends are bent and also they are roughed so that cotton wool, saturated in medicament, may be twisted round.

Without handle. With handle 1/6 extra.

Order No.		s.	d.
600	Length about 8 in., diameter, 2 mm.	3	9
604	Length about 8 in., diameter, 3 mm.	4	0

In Pure Zinc to order at same prices. Supplied to any length in either metal: also with smooth ends if desired.

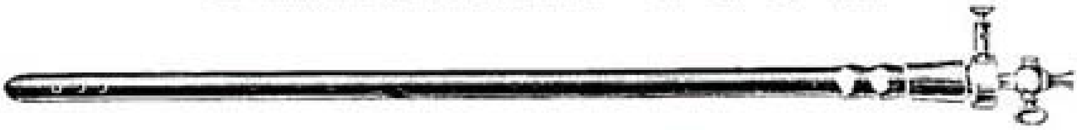


Electrode for Ozæna. Of finely smoothed copper, about 3 ins. in length by ¼ in. width by ⅛ in. thickness, nicely rounded. Wrapped round with lint saturated in copper sulphate. Made to screw on ordinary galvanic handles. Any other sizes to order and in zinc to order at same price.

Order No.		s.	d.
610	... ...	4	0
612	With handle	5	6

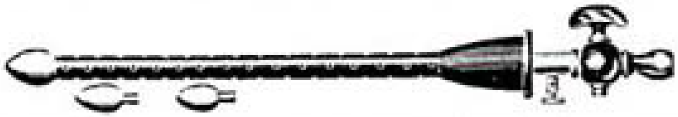
Electrodes for Rhinitis. Thin pure zinc stem with sliding insulating sheath of gum elastic. Made to screw on ordinary galvanic handles. The ends are roughed so that cotton wool, saturated in zinc sulphate, may be twisted round, or lint may be used wrapped round in "puttee" fashion. **If with handle 1/6 each extra.**

Order No.		s.	d.
620	Length about 6 in., diameter 2 mm.	3	6
624	Length about 6 in., diameter 3 mm.	3	9



Electrode for Rectum, by Dr. Curtis Webb, for treating colitis, &c. Consisting of a pure zinc stem inside a rubber insulating tube or bougie. The latter has an opening at its end to allow a solution of zinc sulphate or other solution to pass into the bowel, a nipple and tap being fitted at the other end, together with connecting terminal. A very simple and efficient electrode.

Order No.		s.	d.
630	... ...	12	6

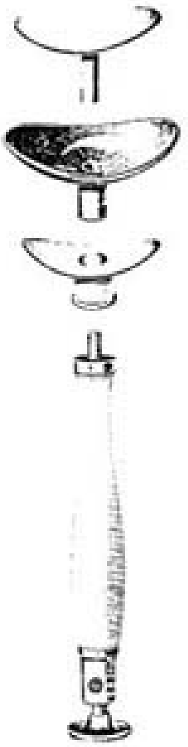


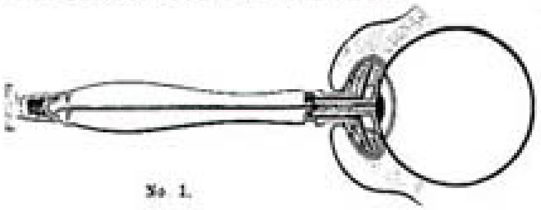
Electrode for Urethra, by Dr. Pollmann, consisting of a thin ebonite tube pierced with numerous holes, and with olives of different sizes to screw to the end. Inside it passes a platinum wire to convey the current. The solution is connected by rubber tube to the nipple provided, an ebonite tap being fitted to control the flow. A connecting terminal is attached and the whole easily takes to pieces for cleaning.

Order No.		s.	d.
640	... ...	18	0

Ionic Medication—Electrodes.

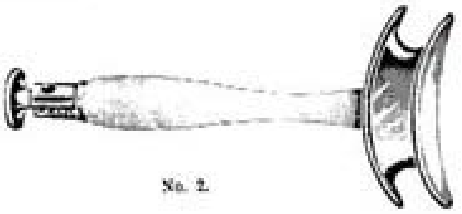
Ophthalmic Electrodes, by Dr. Wirtz.





No 1.

Each electrode is made up of four loose parts, viz., (*a*) celluloid cup of convenient shape for protecting the eyeball; (*b*) metal cup which bears the electrode; (*c*) a celluloid cup for protecting the edges of the eyelids; (*d*) a celluloid handle provided with a screw plug (*e*) and a clamp (*h*). Some ten layers of lint are shaped to the oval form of the electrode (*b*) as well as a piece of unglazed paper. They are perforated in the centre and placed in position over the electrode. The protecting cup for the eyeball is pressed on from the inside and the protecting lid cup from above and the gauze is thus fixed, the latter being saturated in a 2 per cent. solution of zinc sulphate, or other medicament.

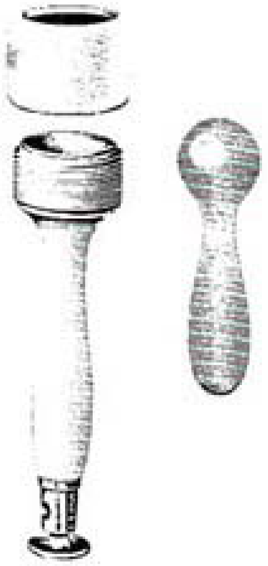


No. 2.

This pattern is used for treating the edges of the eyelids, which rest down into the groove shown, and wherein is placed the cotton wool or lint saturated in the medicament. The front surface plate is of celluloid as with electrode above. The groove of course is of metal and connected by a wire running inside the handle to the terminal.

No. 3. A ball of cotton wool, &c., saturated in medicament, is placed in the cup and pressed with the little knob until it protrudes through the opening in a rounded or conical point, when the cup is screwed on to the handle portion, which has a metal plate at top to make contact.

Order No.		
650.	Set of electrodes, 10 in all, with knob in addition; assorted sizes of the different patterns. Contained in neat polished wood case	£2 8 0



No. 3.

Ionic Medication—Electrodes.

The 4-Cell Bath.

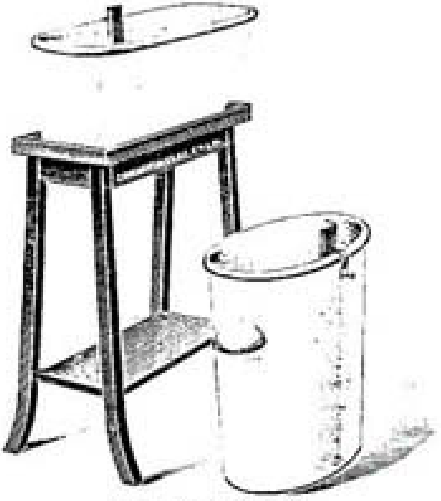
The 4-Cell Bath is the ideal method of administering the various electric currents to the body as will be gathered from the reading matter relating to it on pages 110 to 116.

Mention is made of it here because the bath can be worked by means of any switchboard or battery, and in many cases it is purchased by those primarily interested in ionic medication as constituting an additional therapeutic factor of importance, since the galvanic and other currents are of the greatest utility in treating certain classes of complaints into which ionic medication does not enter. For instance, as a general tonic or stimulus to the system, for exercising certain muscles, as in paralysis, &c., for electro-diagnostics, for neuritis, for writer's cramp, and numerous other purposes.

The 4-Cell Bath is also very suitable for ionic medication. The water of the cells actually constitutes the electrode in contact with the body, the various medicaments being placed simply in the water. In this manner much stronger currents can be passed than by any other, on account of the enormous and absolutely even contact surface represented by the volume of water touching the skin. See pages 110 to 116 for full details.

However, apart from the question of the 4 Cell Bath as a whole, is the undoubted fact that one or more of its cells constitutes the very best way of securing a large **indifferent electrode** for use in conjunction with a saturated pad of lint as "active."

The contact area is much greater than is possible to secure by means of any electrode, and is absolutely even. In view of the strong currents now used for ionic work a large "indifferent" electrode surface is the first essential.



Cells Nos. 670 and 672.
On Pedestal, No. 680.

Porcelain Cells.

Best porcelain cells, finely white glazed, inside and out. Each fitted with 2 porcelain pockets, to prevent patient from touching the carbon electrodes. Each with 2 carbon electrodes, with terminal fittings.

As illustrated on page 113.

Order No.		Length.	Width.	Depth.	Each.
660	**Arm cells**	25 in.	9 in.	7 in.	£1 16 0
662	**Foot cells**	17 in.	10 in.	9 in.	1 16 0

Yellow glazed earthenware cells. Each fitted with a carbon electrode, with nickel-plated hook to hang on edge of cell with connecting terminal.

Order No.		Length.	Width.	Depth.	Each.
670	**Arm cells**	25 in.	9 in.	7 in.	£0 14 0
672	**Foot cells**	17 in.	10 in.	15 in.	0 16 0

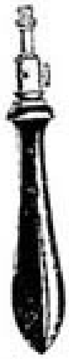
Polished wood pedestals, with lino top for supporting the arm cells at a convenient height.

Order No.		Each.
680	... ...	£0 17 6

Order No.		
692	**Extra carbon**, with hook and terminal for cells Nos. 660,670	0 2 6
694	Ditto for foot cell, No. 672	0 3 6

The advantage of 2 carbons in a cell is the better diffusion of the current resulting. Also, they permit bi-polar treatment by making one carbon positive and one negative, thus being suitable for treating the hands and feet locally.

Electrodes.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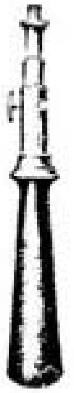
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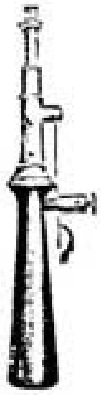
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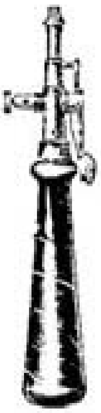
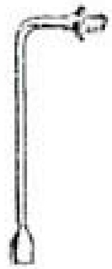
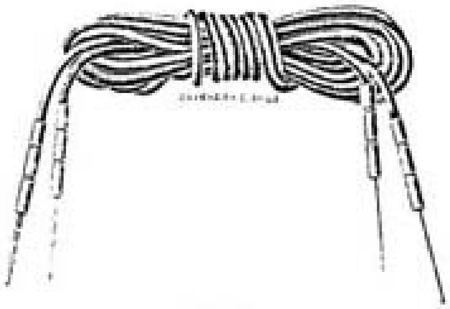

732

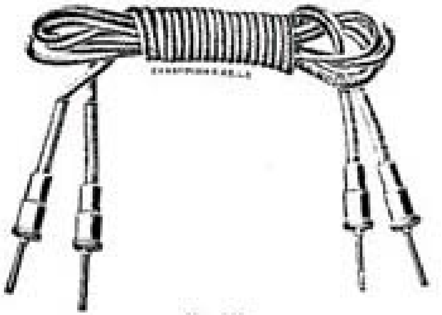

736

Polished Wood Handles.

These handles are all provided with the same standard thread and carry any of the electrodes in this catalogue.

Order No.		s.	d.
720	Simple handle, with terminal screw, 4 in. long	1	6
721	„ „ „ „ „ 6 „ „	2	6
728	Handle with simple switch for interrupting the current, 6 in. long ...	4	6
732	„ „ superior „ „ „ „ „ 6 „ „ ...	6	0
736	Bent metal stem to screw on to any handle, for using electrodes at a right angle, 2 in. long	1	6


No. 750.

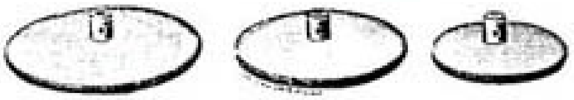

No. 760.

Connecting Cords.

750	Red and green silk covered connecting cables, with plated metal terminal ends, each 5 ft. long; flexible tinsel wire well insulated. Best quality ... ... per pair	1	6
760	Red and green silk covered connecting cables, with unbreakable plated terminal ends, with plated springs to save wear of bending at ends. Flexible stranded copper wire, rubber and silk insulated. With special spring arrangement where attached to terminal inside to secure good and strong contact. **The best quality cables made.** Each 6 ft. long ... ... per pair	3	0

Electrodes.

Unless otherwise ordered, these Electrodes are made to screw on to the handles, but they can be fitted with a terminal screw to take the cable direct at same prices if so ordered. The Electrodes Nos. 810 to 818 are not made to fit handles, because the terminal is situated at one end. They can be supplied with terminal in centre to screw on handles at same prices if so ordered.

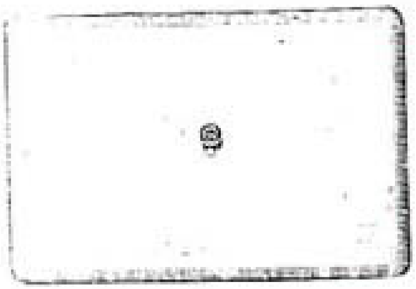


Circular Pad Electrodes.

Covered washleather on under surface, stockinette on top, with flannel pad.

Order No.			s.	d.	
770	½ in. diameter	...	1	0	each
772	¾ " "	...	1	2	"
774	1 " "	...	1	4	"
776	1½ " "	...	1	6	"

Order No.			s.	d.	
778	2 in. diameter	...	1	9	each
780	2½ " "	...	2	0	"
782	3 " "	...	2	3	"
784	4 " "	...	2	9	"



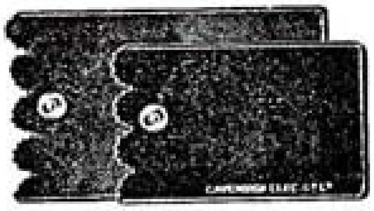
Square Pad Electrodes.

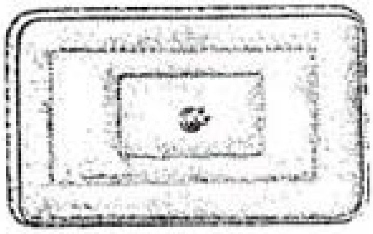
Covered washleather on under surface, stockinette on top, with flannel pad.

Order No.			s.	d.	
790	Size 1 in. by 1 in.	...	1	4	each
792	" 2 " 1 "	...	1	7	"

Order No.			s.	d.	
794	Size 3 in. by 2 in.	...	2	9	each
796	" 4 " 3 "	...	4	6	"

Order No. 798. Size 6 in. by 4 in. ... **7s. 6d.** each





Flexible Plate Electrodes, covered under surface with flannel and top with black American cloth. With flat terminal at one end to receive cable direct.

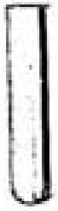
Order No.			s.	d.
810	3 in. by 4½ in.	... ...	1	3
812	4 " 6½ "	... ...	1	9
814	4½ " 8 "	... ...	2	3
816	5 " 9 "	... ...	2	9
818	7 " 10 "	... ...	3	3

Flexible Plate Electrodes of thick white felt. A new idea. They constitute a fine thick pad, retain much moisture, and are extremely flexible.

Order No.			s.	d.
830	3 in. by 2 in.	... ...	2	6
832	4 " 3 "	... ...	3	6
834	6 " 4 "	... ...	4	0
836	8 " 5 "	... ...	4	6
838	10 " 6 "	... ...	5	0

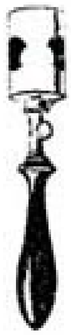
Any of the Electrodes on this page can be made to size and shape desired at proportionate prices.

Electrodes.



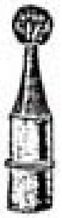
Nickel-Plated Metal Handle, to screw on to polished wood handles, page 27. To hold in the hand, or a small sponge can be pressed into it.

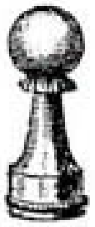
Order No.		s.	d.	
860	... 3 in. long × ¾ in. diam. ...	0	9	each.
862	... 4 in. ,, × ¾ in. ,, ...	1	0	,,

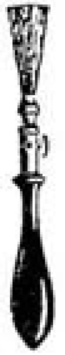


Nickel-Plated Sponge Holder, made to screw on to the handles, page 27.

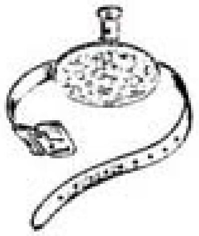
Order No.		s.	d.	
866	... ... Without handle, 1 in. diam.	3	0	each.

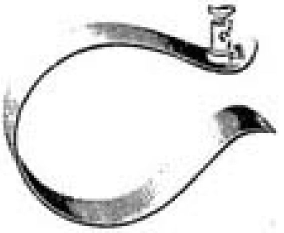






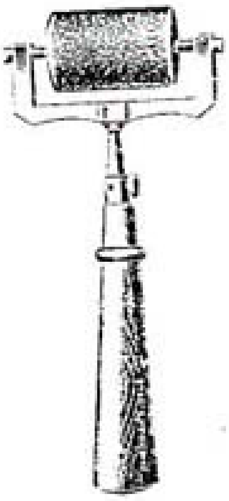
Order No.		s.	d.	
870	**Button Electrode**, small washleather top, ½ in. diam., to screw on handles	1	3	each.
874	**Button Electrode,** large washleather top, ¾ in. diam., to screw on handles	1	6	each
880	**Tinsel Wire Brush Electrode,** to screw on handles	1	6	,,





Order No.		s.	d.	
890	**Wristlet Electrode,** consisting of a pad electrode, covered washleather and stockinette, with leather strap for fastening round the wrist. Frequently used as indifferent electrode on the patient's wrist when operating with needle holder in the removal of superfluous hairs. Also much used on operator's own wrist in electrical massage. A very convenient electrode for all purposes, ensuring a good even contact	4	0	each.
894	**Nickel-Plated Spring Wristlet,** frequently used on operator's wrist in electrical massage	2	6	each.

Electrodes.



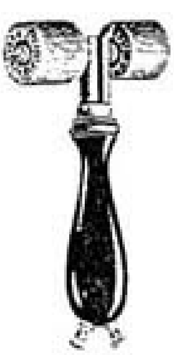
Roller Electrodes, covered wash-leather or stockinette.

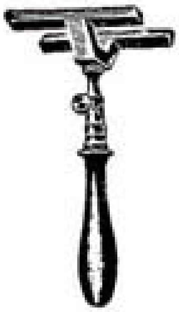
These are the best rollers manufactured. They are provided with massive lacquered brass mounts instead of the simple bent wire mounts, adopted on the cheap and inferior types. They are therefore very strong and stand the wear and pressure without bending. Best make and finish.

Including a good 6-in. polished wood handle.

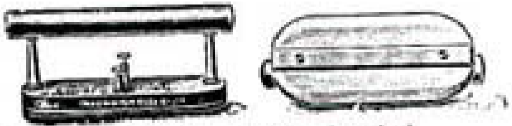
Order No.		s.	d.
900	1½ in. long × 1¼ in. diam.	4	6
902	2 in. long × 1¼ in. diam.	5	0
904	2½ in. long × 1¼ in. diam.	5	6

These rollers are very convenient for changing the place of contact and for electrical massage.

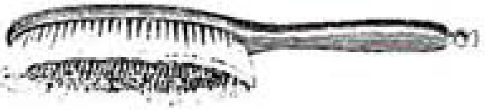




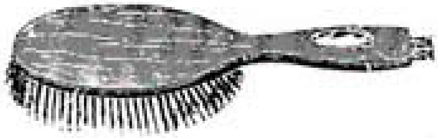
Order No.		s.	d.
910	**Double-Pole Roller Electrode**, covered wash-leather or stockinette, with good 6-in. polished wood handle with 2 terminals. Best quality, and well and strongly made	10	6
912	**Double Roller Electrode**, exactly as above, but single-pole ...	10	0
920	**Single-Pole Beam Electrode**, with two finely rounded and nickel-plated contact surfaces, much used for treating the spine, &c. Made to screw on handles. Price without handle	5	0
922	**Beam Electrode**, exactly as above, but **double-pole**	5	6
930	**Double-Pole Electrode**, with two finely smoothed and plated metal surfaces with insulating division. Convenient for changing the place of contact and for electrical massage	15	0



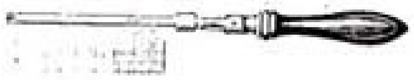
Electrodes.



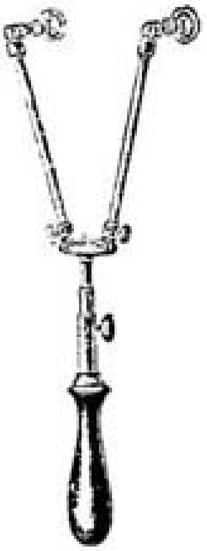
Order No.		s.	d.
940	**Electric Hair Brush. No. 1,** with metal wires surrounded by one row of black bristles. Wood finely polished	4	6
944	**Superior Brush. No. 2,** a little larger than No. 1, with metal wires surrounded by two rows of best white bristles. Wood finely polished	7	6
948	**Highest Quality Brush. No. 3,** same size as No. 2, with metal wires surrounded by three rows of best white bristles. Wires and bristles extra long. Wood finely polished	10	6



Order No.		s.	d.
952	**Double Pole Brush,** same as No. 2 pattern, but bi-polar, with two terminals	9	6

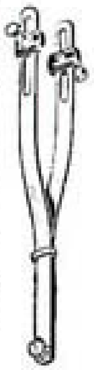


Order No.		s.	d.
960	**Electric Comb,** nickel plated, with polished wood handle. Comb itself about 4 in. long	2	6
964	**Same,** on handle, but comb about 5½ in. long	3	0



Double Arm Electrode for carrying two electrodes, providing two points of contact. Very convenient for muscle testing, &c. Ionic medication or any other electrodes can be used with it. The two arms are adjustable any distance apart. Made to screw on handles, page 27.

Order No.		s.	d.
970	Finely plated. Without handle and without electrodes	12	0

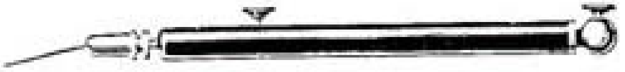


Double Arm Electrode for carrying two electrodes. Especially for the ears. The two arms are adjustable and the electrode carriers move in two slides.

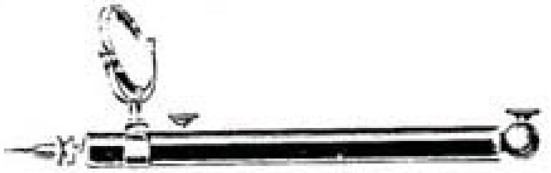
Order No.		s.	d.
974	Finely plated. Without electrodes	11	0

Both the above can be used mono-polar or bi-polar as desired.

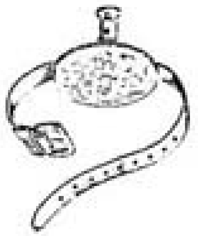
Electrodes—Electrolysis.



Order No.		s.	d.
1000	**Needle Holder,** to receive different size Steel and Platinum Needles. Of polished ebonite with plated fittings. A very neat and convenient holder. Without switch	3	6
1004	**Same Holder,** but with **Switch** (Fig.)	4	6



		s.	d.
1008	**Magnifying Lens,** to magnify the hair in epilation. Made to slide on the above needle holders. They are an improved pattern permitting every adjustment, so that they can be used to utmost advantage. The lens itself moves on its axis and also rotates on the mount, while an additional joint provided in the mount permits it being moved forwards or backwards horizontally. Thus any position is readily obtained, so that the lens can be used to much better advantage. The lens itself is of rather larger diameter than those usually adopted and of excellent magnification	5	0



		s.	d.
1020	**Wristlet Electrode,** consisting of a pad electrode covered wash-leather and stockinette, with leather strap for fastening round the wrist. Invariably used as indifferent electrode on patient's wrist when operating with needle holder in the removal of superfluous hair. Also frequently used on operator's wrist in electrical massage. A very convenient electrode for all purposes, ensuring a good even contact	4	0
1024	**Forceps,** for lifting out hairs after treatment. Neat, well made and finished. Nickel plated	2	0
1028	**Platinum Needles,** about 1 in. long, to fit into needle holders. These new needles are specially stiffened and will be found much better to work with ...	1	9
1032	**Same,** but with terminal to receive cable direct, instead of fitting into needle holder...	2	6

		s.	d.
1036	**Platinum Needle,** with spear-shaped head, for treating growths, nævi, &c. To fit into needle holders	2	6
1040	**Same,** but with terminal to receive cable direct	3	6

ZINC AND COPPER NEEDLES.

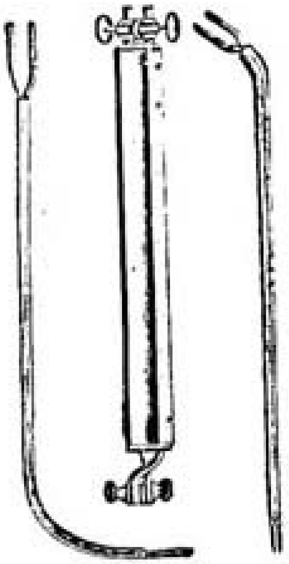
To fit holders such as No. 1000, &c.

1050	Of Zinc ... ... each	0	3
1054	Of Copper	0	3

With terminal to receive cable direct.

1058	Of Zinc	1	3
1062	Of Copper	1	3

Electrodes—Electrolysis.

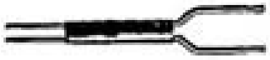


Needle Holder for **double needles,** for treating nævi, &c. Of polished ebonite with plated fittings. Length about 5 in.

Order No.		s.	d.
1080	With switch	15	0
1082	Without switch	12	6

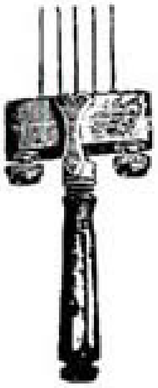
Double Needle, with platinum points. To fit above holder.

Order No.		s.	d.
1086	Straight	3	3
1088	Curved	3	3



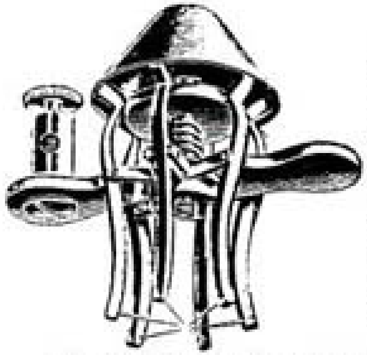
Small Double Needle, to fit above holder. With platinum points.

Order No.		s.	d.
1090	... ...	3	0



Bi-polar Multiple Needle Holder, after Dr. Lewis-Jones, for treatment of growths, &c. It is made to receive either platinum or steel needles, which can be instantly removed or replaced. Either 2, 3, 4 or 5 needles can be used according to the size of growths, and the action is bi-polar. The centre and two outside needles are connected on the one pole and the remaining two needles on the other pole, so that 1, 2 or 3 needles can be used monopolar if desired.

Order No.		s.	d.
2000	Of polished ebonite, with plated fittings, handle and 2 terminals	15	0

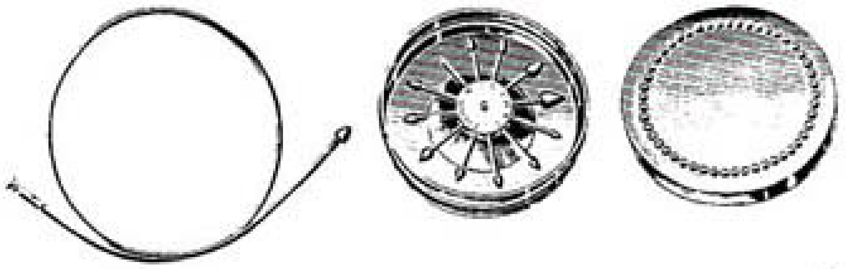


Extirpator for Warts, &c. With 6 platinum-iridium needles, which all move simultaneously to surround the root of the growth, thus enabling variation of the diameter as required. The pressure is effected by spring tension and may be adjusted in the finest degree with a screw arrangement. The instrument permits the electrolytic removal of warts in a very simple and effective manner. In use the Extirpator is connected with the negative pole of a galvanic current.

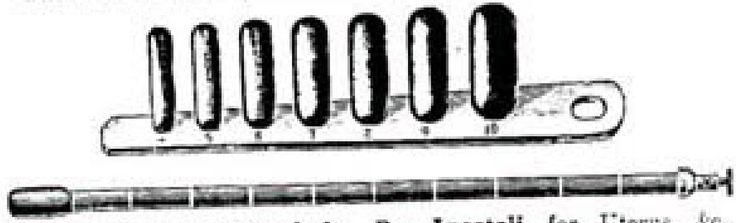
The indifferent electrode connected to the positive pole should be of large surface and well moistened. It may be placed on any part of the body convenient.

Order No.		
2020	Well made and highly finished, nickel plated	£1 15 0

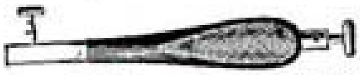
Electrodes.



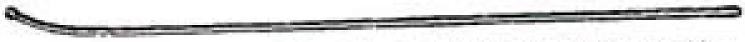
Order No.		s. d.
2040	**Urethral Electrode by Dr. Collins,** for treatment of strictures, &c., consisting of a thin flexible bougie, with terminal at one end and with metal stem running its whole length. With 12 metal olives, finely rounded and plated, to screw on bougie, sizes 9-20 charriere. The whole in nickel plated metal case	14 6



2050	**Carbon Sound Electrode by Dr. Apostoli,** for Uterus, &c., consisting of an insulated stem about 12 in. long with terminal at end. With 8 carbon points to screw on, sizes 5-12 mm., with base plates on which they screw when not in use	£1 5 0



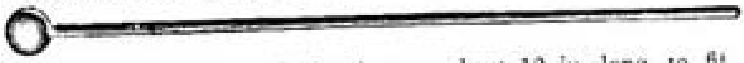
2060	**Handle** with terminal and with set screw for holding the following electrodes	7 0



Sound Electrodes of aluminium, by Prof. Engelmann, flexible, about 12 in. long, to fit above handle.

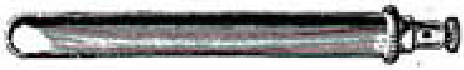
Order No.		s. d.
2064	2 mm.	1 6
2066	3 mm.	1 9
2068	4 mm.	2 0
2070	5 mm.	2 3

2072	**Wadding Holder** of aluminium by Prof. Engelmann, about 12 in. long, with roughed end, to fit above handle	2 0



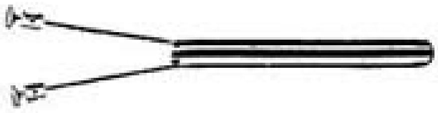
2074	**Ball Electrode** by Prof. Engelmann, about 12 in. long, to fit above handle	2 0
	Platinum Iridium Needle by Dr. Apostoli, about 1 in. long, 1½ mm. thick, on metal stem about 12 in. long.	
2076	**With rounded point**	15 0
2078	**With spear shaped point**	16 0
2080	Flexible gum elastic insulating tubes to slide on the stems of the above electrodes ... ... each	1 0

Electrodes.

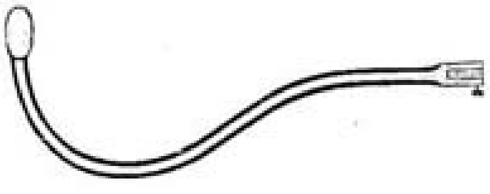


Zinc Electrodes for Rectum, &c., length about 5½ in., diameter ⅞ in. Other sizes to order at same prices.

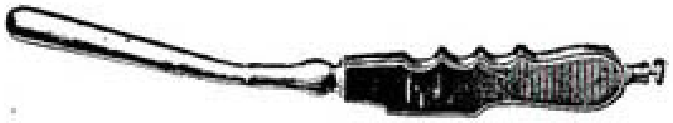
Order No		s.	d.
2090	With terminal to receive cable direct	3	0
2092	Made to screw on electrode handles	2	6



2096	**Bi-polar Rectal Electrode,** finely rounded and-plated. With insulating division. With two terminals	10	0



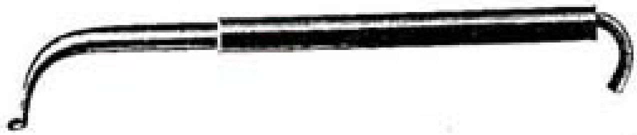
2100	**Single Pole Rectal Electrode,** with finely nickel plated knob about 10 mm. diameter on flexible stem about 8 in. long. Made to screw on electrode handles, with binding screw to fix the handle ...	3	6
2102	**Same,** but with terminal to receive cable direct	4	0



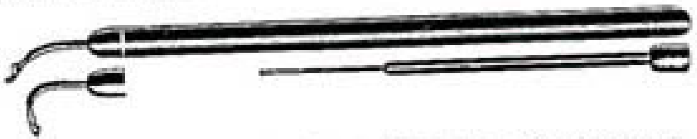
2110	**Prostate Massage Electrode** by Dr. Scharf, consisting of a finely rounded and curved metal rod, nickel plated. With wood handle and terminal to receive cable	15	0
2120	**Vaginal Electrode,** similar to Nos. 2090 and 2092, but of greater diameter. Of metal finely nickel plated. With terminal to receive cable direct	3	6
2122	**Same,** but made to screw on electrode handles	3	0

Any description of electrode can be made to order on receipt of rough sketch dimensions, &c.

Electrodes.



Order No.		s.	d.
2140	**Dental Electrode,** consisting of polished ebonite handle about 5 in. long, curved at end and provided with platinum contact. With connecting cable and terminal	3	0
2142	**Same,** but with pointed end	3	0



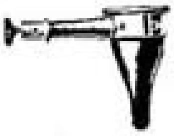
Dental Electrode by Zierler, for sterilisation by galvanic current.

2150	**Handle** with threaded end to carry the following electrodes. With terminal to receive cable	3	6
2152	**Platinum-Iridium Needle** with insulated stem. To screw on above handle	3	0
2154	**Platinum Electrode** for treatment of Alveolar-Pyorrhœ, slightly curved. To screw on above handle	5	0
2156	**Same,** but bent knee-shaped	5	0

2170	**Dental Electrode** by Dr. Schroder, sterilisable, consisting of a curved and tapered glass tube, glass stopper with terminal for filling, with a wire running the whole length. A little cottonwool is placed in the tube and pushed down to the point. The tube itself is filled with water	6	0

By using a medicament instead of plain water, this electrode will serve admirably for ionic medication.

Ear Electrode.

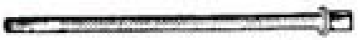


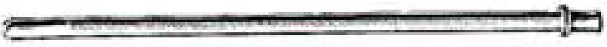
Ear Electrode by Prof. Brenner, conical shaped, of polished ebonite with plated metal mount. With platinum wire inside to make contact. In use the electrode has water poured into it to convey the current to the ear.

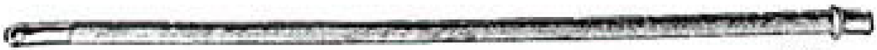
Order No.		s.	d.
2180	To screw on electrode handles, page 27	6	0
2182	With terminal to receive cable direct	6	0

By using a medicament instead of plain water, this electrode will serve admirably for ionic medication.

Electrodes.


2206


2204


2202

2200

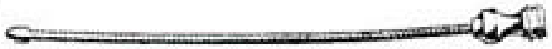
Electrodes for Rectum and Uterus, with insulating bougie covering.

Order No.	s.	d.	Order No.	s.	d.	Order No.	s.	d.	Order No.	s.	d.
2200 ...	6	6	2202 ...	5	6	2204 ...	3	6	2206 ...	2	6

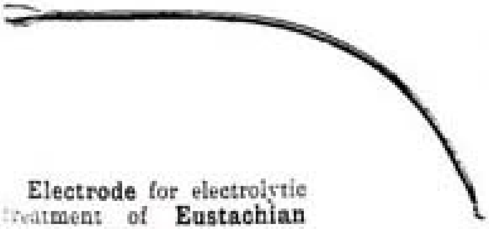
2210	**Single Pole Vaginal Electrode**, by Dr. Apostoli, similar to No. 2200, but 18 and 22 mm. diameter	14	0
2212	**Double Pole** ditto ditto ditto with a second contact ring a little way down stem	15	0
2216	**Single Pole Uterus Electrode**, by Dr. Apostoli, similar to No. 2202, but only about 4 mm. diameter	8	6
2218	**Double Pole** ditto ditto ditto with a second contact ring a little way down stem	10	6

All the above are fitted with terminals to receive cable direct, but by removing the screw of terminal can be used on electrode handles.

2230	**Urethral and Bladder Electrode**, with flat polished ebonite handle, with terminal to receive cable	8	0



2240	**Urethral Bougie Electrode**, with stem insulated with gum elastic or gutta percha. With nickel-plated metal olive and made to screw on electrode handles	6	0
2242	**Same**, but with terminal to receive cable direct	6	6



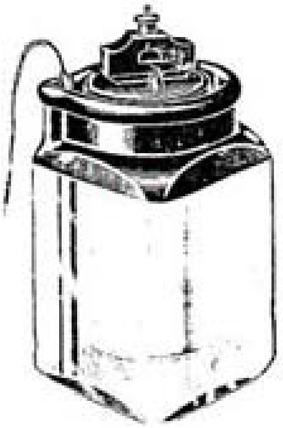
Larynx Electrode, with bougie stem, with nickel-plated olive. Made to screw on electrode handles.

Order No.		s.	d.
2250	... ...	2	6
2252	**Same** with terminal to receive cable direct	3	0

Electrode for electrolytic treatment of **Eustachian Tube**, consisting of polished ebonite tube catheter, with an inner wire provided with platinum knob, with terminal.

Order No.		s.	d.
2260	... ...	6	0

Cells.



Leclanché Cells, porous pot type. These cells are very convenient for all purposes, providing a good output for a very lengthy period. They can be recharged as required by cleaning the inside plates and refilling with sal ammoniac.

The porous pot is filled with a mixture of best peroxide of manganese and crushed carbon. The carbon plate is of carbon throughout. The zinc is of best solid drawn metal. 98 per cent. purity, amalgamated.

To use, place the porous pot and zinc rod in the glass jar, and fill two-thirds full with a solution of sal ammoniac, using 2 oz. of sal ammoniac to the pint of water.

Order No.		s.	d.	
2300	No. 1, 3 pint size	2	0	each
2310	No. 2, 2 „ „ (Fig.)	1	3	„

If required sealed, 6d. extra per cell.

These cells are exceptionally suitable for stationary batteries fitted up in boxes, cupboards, &c., especially where strong galvanic currents are required, such as with hydro-electric baths, &c., in which cases the strain on the usual small dry cells exhausts them far too quickly. They also serve well for working surgical lamps.

Spare Parts.

Porous pots, charged with peroxide of manganese and crushed carbon. Carbon plate fitted with brass terminal (Fig.).

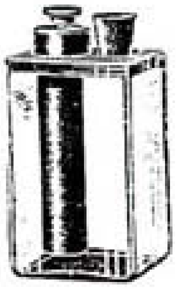
Order No.		s.	d.	
2320	For No. 1 size cell	1	2	each
2322	„ „ 2 „ „	0	8	„

Zinc rods. Best solid drawn. 98 per cent. purity, amalgamated.

Order No.		s.	d.	
2330	For No. 1 size cell	0	4	each
2332	„ „ 2 „ „	0	3	„

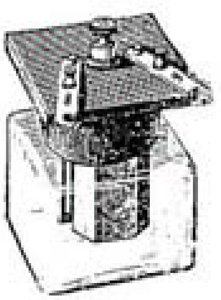
Glass jars. Dipped.

Order No.		s.	d.	
2340	For No. 1 size cell	0	6	each
2342	„ „ 2 „ „	0	4	„



Bichromate cell for Faradic batteries, &c. Glass cell, complete with carbon rod, with brass mount and terminal, and with a loose zinc. Size 4 in. over terminal by 2 in. by 1½ in.

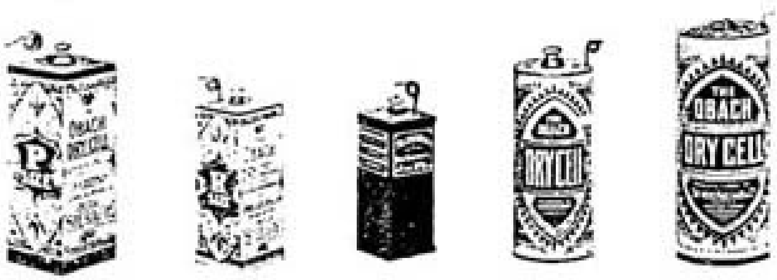
Order No.		s.	d.	
2360	... ...	4	0	each
2364	Spare zincs ...	0	3	„



Bichromate cell for Faradic batteries, &c. Glass cell, ebonite top, lacquered fittings. With 2 carbon plates and 1 zinc plate, the latter with hinged lifting rod to lift zinc out of acid when not in use. Height 4 in. by 2¼ in. square.

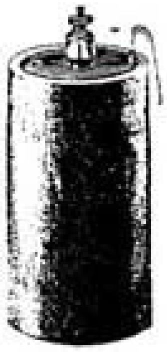
Order No.		s.	d.	
2370	... ...	10	0	each

Cells.



Order No.		s.	d.
2390	**Obach Dry Cell,** Size P, 6½ ins. high × 2¼ × 2¼. For Eros Battery No. 104, &c.	2	9
2394	**Obach Dry Cell,** Size R, 5 ins. high × 1¾ × 1¾. For Batteries No. 100, 102, &c.	2	3
2398	**Obach Dry Cell,** Size C, 6¼ ins. high × 2$\frac{7}{16}$ diam. For Eros Battery No. 104, &c.	2	6
2410	**Hellesen Dry Cell,** 4½ ins. high × 1½ × 1½. For Galvanic Batteries, pages 14 to 21, &c.	1	6

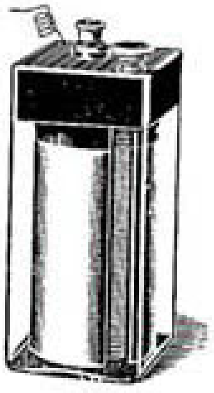
Cavendish Dry Cells.



Best Quality.

Order No.		s.	d.
2420	**Round Cell,** 5¼ ins. high × 2½ ins. diam. For Eros Battery No. 104, Battery No. 106, &c. ...	2	0
2424	**Square Cell,** 5 ins. high × 1¾ × 1¾. For Batteries Nos. 100, 102, &c.	2	0
2428.	**Square Cell,** 4½ ins. high × 1½ × 1½. For Galvanic and Electrolysis Batteries, pages 14 to 21, &c.	1	3

Wet Leclanché Cells. The risk of breakage and spilling of acid is a disadvantage of these cells for ordinary general use in galvanic batteries, &c., but they are very suitable for the Colonies, where dry cells are difficult to obtain for replacements. The cells can be recharged when required by cleaning the inside plates and refilling with fresh Sal Ammoniac. They give a good current and have a long lifetime.



Order No.		s.	d.
2440	5 × 1½ ins.	1	0
2444	4½ × 2 in.	1	6

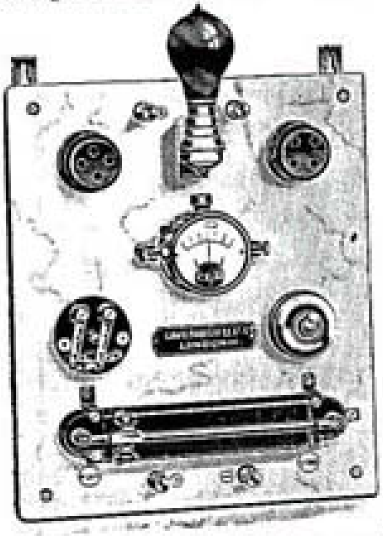
Switchboards,

Using the Continuous Current Main

FOR

Galvanisation, Ionic Medication and Electrolysis

(Also working from Leclanché Batteries, page 45).



Switchboard for **galvanisation, ionic medication** and **electrolysis** of white marble. With sliding contact shunt rheostat or volt regulator to regulate the current from 0 to 80 volts by fine graduations; wound on slate with a square bar, ensuring good contact always being made. With incandescent resistance lamp, switch, china fuse, two terminals for main, two terminals for electrodes. Best make and finish in every detail.

Order No.		
3000	For connection to any continuous current main	£3 8 0
3004	Same board, but fitted with pole reverser	4 4 0
3010	Same as No. 3000, but fitted with best type milli-ammeter with two readings, viz: 0–15, 0–150 m.a., as described under Order No. 170 4	5 14 0
3014	Same, but with pole-reverser in addition	6 10 0
3016	Same as No. 3000, but fitted with best type milli-ammeter with two readings, viz: 0–15, 0–150 m.a., as described under Order No. 164 8—large diameter for switchboards	6 10 0
3018	Same, but with pole reverser in addition	7 6 0
3020	Same as No. 3000, but fitted with best type milli-ammeter with three readings, viz: 0–5, 0–50, 0–500 m.a., as described under Order No. 160	6 15 0
3024	Same, but with pole-reverser in addition	7 10 0

In each case the milli-ammeter is mounted on pillars.

The following accessories are included with each board, viz: 1 pair silk covered cords, 1 pair polished wood handles, 1 large indifferent electrode and 4 assorted smaller electrodes.

Same boards in portable form, see page 43.

Switchboards

Using the continuous current main for galvanisation, ionic medication and electrolysis

(Also working from Leclanché batteries, page 45).

SPECIAL IONIC OUTFITS.

Same boards in portable form, page 43.

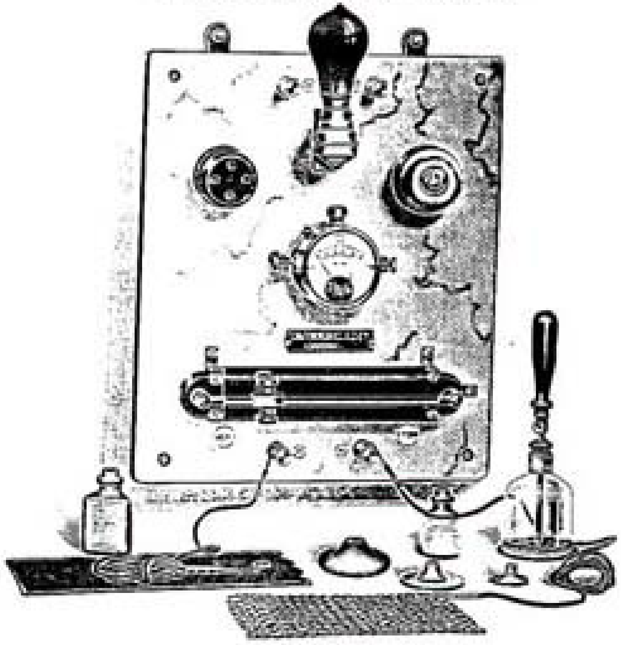


Fig. 12.

Switchboard of white marble, with shunt rheostat, with incandescent resistance lamp, with switch, china fuse, two terminals for main, two terminals for electrodes, exactly as described on previous page.

Order No.				
8050	For connection to any continuous current main. With best type milli-ammeter with two readings, viz.: 0–15, 0–150 m.a. as described under Order No. 170/4	£6	0	0
8054	Same, but with pole-reverser in addition	6	16	0
8056	Same as No. 8050 but fitted with best type milli-ammeter with two readings, viz.: 0–15, 0–150, as described under Order No. 164/8, large diameter for switchboards	6	16	0
8058	Same, but with pole-reverser in addition	7	12	0
8060	Same as No. 8050, but fitted with large size milli-ammeter with three readings, viz.: 0–5, 0–50, 0–500 m.a. as described under Order No. 160	7	0	0
8064	Same, but with pole-reverser in addition	7	16	0

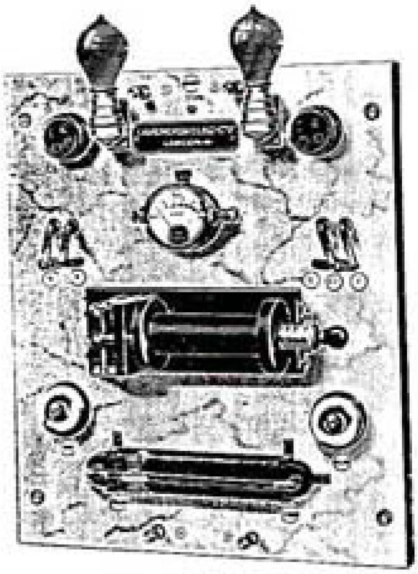
The following accessories specially for ionic medication are included, viz.: one pair silk covered cords (No. 750), one polished wood handle (No. 720) for carrying the small electrodes; one large indifferent electrode (No. 816), one glass cup electrode for holding medicaments (No. 408), one zinc chain mail electrode as "active" for treating joints, &c. (No. 874), one zinc electrode (No. 438), one copper electrode (No. 458), and one carbon electrode (No. 478).

For Ionic reading matter see pages 18-20. Ionic batteries, page 21. Ionic electrodes, pages 22-26, &c.

A **Special Booklet** relating to general principles, complaints successfully treated and method of procedure sent free on request.

Switchboards.

For Galvanisation, Ionic Medication and Electrolysis, and Faradisation.



Working from any continuous current main or Leclanché batteries, page 45.
Of white marble, with shunt rheostat, incandescent resistance lamp, switch, china
fuse, exactly as specified on page 40.

Faradic portion: Coil providing primary current only, suitable for all purposes
but specially suitable for Hydro-Electric Baths. With crank switch giving six
different degrees of strength by varying the windings of coil, each degree perfectly
regulated by the graduated sliding iron core. As described fully under Order No. 120.
With incandescent lamp, switch, china fuse.

With two terminals for main and terminals for Electrodes.

With best moving coil Milli-Ammeter, with two readings, viz.: 0-15, 0-150
m.a., as described fully under Order No. 170/4.

Order No.		
4000	For connection to any continuous current main	£10 0 0
4004	Same board, but fitted with pole reverser	10 16 0
4010	Same board (No. 4000), but with Watteville switch, giving galvanic, Faradic and combined current at same terminals	10 16 0
4014	Same board (No. 4000), but with pole reverser and Watteville switch (Fig.)	11 12 0

Any board fitted with best type Milli-Ammeter with two readings, viz.: 0-15, 0-150, large diameter specially for switchboards, as described under Order No. 164 8 ... ... extra — 0 16 0

Any board fitted with best type Milli-Ammeter with three readings, viz.: 0-5, 0-50, 0-500 (the highest reading is essential for full-body Hydro-Electric Baths) as described fully under Order No. 160. ... ... extra — 1 1 0

Any board fitted with Faradic coil, No. 180, 5/- extra. With coil, No. 184, same price. With coil, No. 188, 15/- extra. With coil, No. 142, 10/- extra.

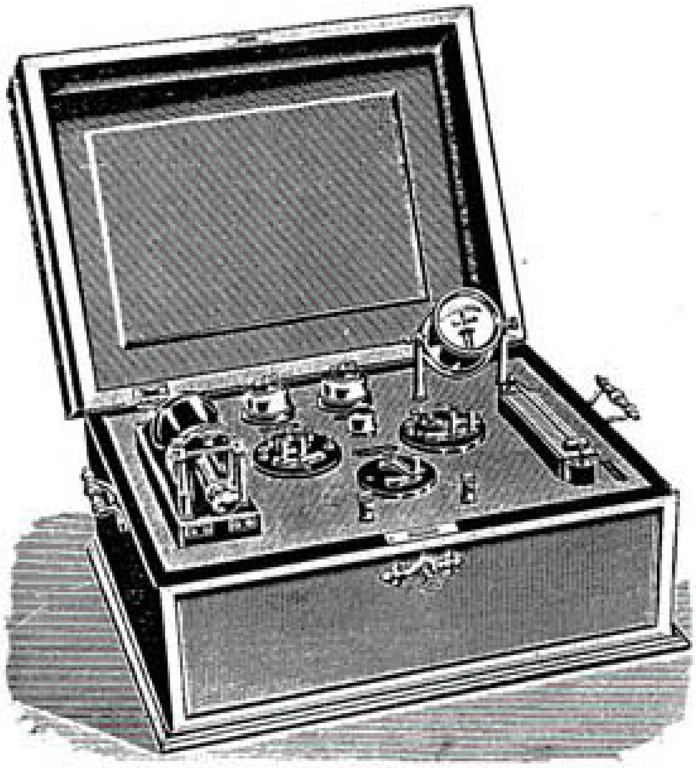
The accessories specified on page 40 are included with each board.

Portable Switchboards

FOR

Galvanisation, Ionic Medication, Electrolysis and Faradisation,

Working from any continuous current main or from Leclanché Batteries, page 45.



Any Board listed on page 42 can be mounted up in polished oakwood, walnut or other case, with lock and key, drawer for electrodes and handles for carrying at an increased cost of **£1 15 0**, including accessories as usual.

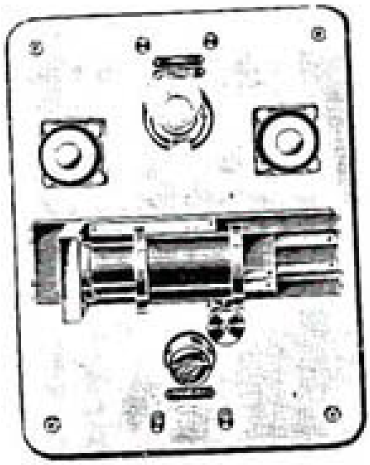
Any Board listed on pages 40 and 41 can be similarly mounted at an increased cost of **£1 10 0**.

Unless otherwise ordered the box would be of polished fumed oak in our usual style.

Any Board listed on pages 40 and 41 can also be mounted in a solid leather "attaché" case, with spring lock and key and handle, at an increased cost of **£1 10 0**. The leather stands the wear and continual handling equally well, is lighter, and is preferred by many for carrying about, more resembling an instrument case and less like the every-day "Battery."

Switchboards.

For Single Phase Sinusoidal-Alternating Current.



Switchboard for single-phase sinusoidal current to work direct from alternating current main.

Of white marble, with one transformer induction coil, switch, china fuses and incandescent lamp. Terminals for main and for electrodes.

Coil of best make, covered polished black celluloid and mounted on polished wood base. Perfect regulation of the strength is obtained by sliding the secondary coil over the primary coil.

Order No.		
4040	... ...	£4 4 0
4042	If secondary coil operated by rack and pinion movement (Fig.)	4 14 0

This board can be used for full hydro-electric baths, for 4-cell bath or with ordinary electrodes. The current being purely induced in the coil, the patient does not receive the main current, so there is no risk of earth shocks.

Single Phase Sinusoidal Current

from continuous current main.

To obtain single phase sinusoidal alternating current from continuous current main, a motor-transformer is necessary to provide the sinusoidal current which is then connected to switchboard as above. The motors are of best design and construction, finely nickel-plated, mounted on plated metal base and then mounted again on a little white marble board with terminals ready for connecting to the main and to the switchboard. The sinusoidal current is derived from two slip rings on the armature.

Order No.		
4060	Motor transformer for 12 volts (accumulators)	£6 0 0
4062	" " " direct current up to 120 volts	6 10 0
4064	" " " " " " 250 volts	7 0 0

These motors provide ample current for the 4-cell bath and for all work with electrodes but not for full water baths. They can be used for working vibrator No. 7360, ear pumps No. 7450, centrifuge No. 7490, fan No. 7420, surgical drills, Leduc interrupter No. 7430, &c.

Motor-Transformers, larger Type.

For full water baths, 4-cell bath and all electrode work.

Order No.		
4080	Motor transformer for 12 volts (accumulators)	£7 0 0
4082	" " " direct current up to 120 volts	7 10 0
4084	" " " " " " 250 volts	8 0 0

These larger motors can be used for working the vibrator, ear pumps, centrifuge, fan, drills, Leduc interrupter, &c., as mentioned above and also powerful enough to work pneumo-massage pump No. 7470.

It is advisable to have a sliding contact rheostat mounted on switchboard in order to control the speed of the motor and the frequency of the alternations of the sinusoidal current. It is better for the life of the motor to be always started with a rheostat. Rheostat, wound on slate, with square bar as illustrated, page 40. This adds **£1 5 0** to price of switchboard.

Switchboards.

Switchboards can be manufactured to provide any currents desired, viz., three-phase or single-phase sinusoidal current, faradic current, galvanic current, intermittent galvanic current, &c., and in any combination. Also in combination with currents for cautery, light, &c., &c.

They can be supplied for mounting on the wall, in portable forms, on tables or trolleys, in cabinets and in any manner desired.

Prices and full specification gladly furnished on receipt of requirements.

When enquiring (or ordering) always state if main current is continuous or alternating and the voltage. In the case of alternating current also state periodicity as well as voltage. If no main is available we will advise what is the most advantageous arrangement to fulfil the requirements of each case.

Leclanché Cells.

Porous Pot Type.

Any of the Galvanic and Faradic Boards listed on pages 40-43 can be worked by means of 30 or more of these cells, which are particularly suitable for use in the colonies. They last a long time and maintain an excellent output. After many months' use the cells can be cleaned, the zinc rods scraped, and then recharged with fresh sal ammoniac, an operation that can be repeated several times.

Cells and Parts will be found listed, page 38. Polished wood boxes, cupboards or cabinets, &c., to contain these cells are supplied at all prices.

Cell Collectors.

Instead of a Rheostat to regulate the strength of the current as is mounted on the various galvanic switchboards, a cell collector can be taken instead, if preferred, the same as shown and described on page 15; actually a little board can be supplied, with collector, pole reverser, milli-ammeter, &c., as shown on battery, page 15, or with faradic coil, Watteville key, &c., as well, for faradisation.

Quotations and full details gladly furnished on request.

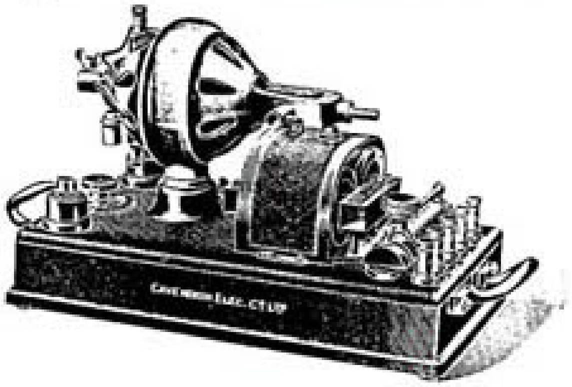
Transformers.

For Cautery and Light, to work off Continuous Current Main.

To obtain cautery from continuous current main one must adopt either a shunt switchboard, an interrupter transformer, or a motor transformer with the advantages on the side of the latter in every way. **The Shunt Boards** are large and very heavy, and portability is out of the question. They consume an enormous current from the main, 30 or 40 amperes, and therefore can only be used where special heavy cables are laid capable of carrying such currents.

The Interrupter Transformer can be in switchboard form or in portable form. They consume from the main only one or two amperes, so no objection can be raised against them on this account, but they are very noisy in working, there is heavy consumption of the platinum points of the hammer interrupter and they require adjustment from time to time.

The Motor Transformer is compact and portable. The main consumption is only one or two amperes, so they can be worked from any wall socket or ordinary lamp-holder, not necessitating any but usual cables. For the same reason they can be used at a patient's house where electric light is installed. They are quiet in working, require no adjustments, and are not subject to wear and tear. Moreover, they provide motor power for working drills, vibrators, pumps, &c., &c.



Motor-Transformer for Cautery and Light, with large type motor, finely nickel plated, mounted on enamelled iron base only 15 in. × 8 in., and fitted with two handles for carrying. Providing current for cautery up to about 25 amperes, sufficient for all usual burners. Providing current for light up to about 20 volts, so that all usual surgical lamps can be worked.

With 2 Rheostats to regulate the currents to suit the different burners and lamps. With switches and terminals, and complete with flexible cable and plug for main connection.

Finely plated and enamelled, all fitments of the best, and the whole of best design and construction throughout.

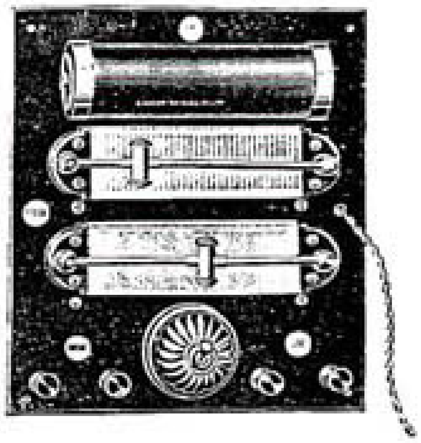
Order No.						
4200	For continuous current up to 120 volts.	...	...	£15	15	0
4202	,, ,, ,, ,, 250 ,,	...	...	16	10	0

The motor will work vibrator (No. 7360); ear pumps (No. 7450); pneumo-massage pump (No. 7470); Leduc interrupter (No. 7430); centrifuge (No. 7490); fitting (No. 7540); surgical drills, fan, &c., &c.

Universal machine for cautery, light, galvanic, sinusoidal and galvano-sinusoidal currents, &c. Listed page 108.

Transformers.

For Cautery, Light, and Sinusoidal-Alternating Current to work off Alternating Current Main.



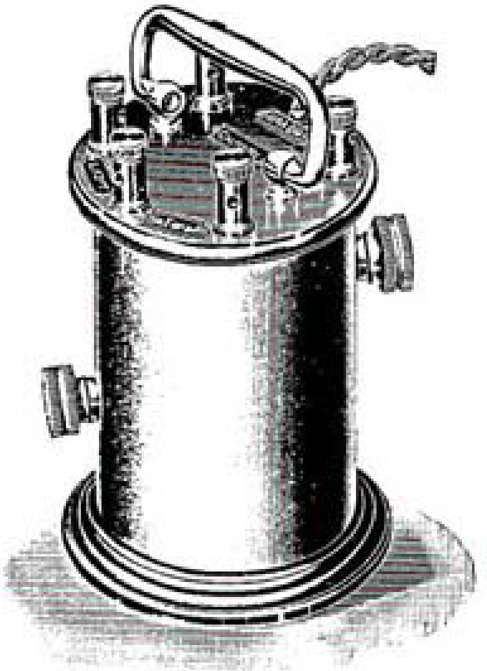
Switchboard Transformer for **Cautery and Light,** of black enamelled slate or white marble, with transformer coil giving up to about 20 amperes, sufficient for all ordinary burners, and up to about 15 volts for surgical lamps, meeting all requirements. With sliding contact Rheostat to regulate the current to suit each cautery burner and with sliding contact Rheostat to regulate the voltage to suit each surgical lamp, with switches and with terminals.

Order No.		
4220	... ...	£4 0 0
4224	For cautery only	3 0 0
4228	Polished wood frame with glass door to enclose the board ...	1 5 0

Portable Transformer to work off alternating current main. In finely plated metal case, containing the transformer coils. Rheostats operated by rack and pinion movements, providing gradual regulation of the various currents for cautery, for surgical lamps, and for the sinusoidal-alternating current.

With necessary terminals and with length of flexible cable to connect to main.

Order No.		
4240	For Cautery, Light and Sinusoidal Current	£6 0 0



These transformers are new and are exceptionally compact and convenient, constituting a great improvement over the previous cumbersome appliances, while at the same time effecting a great saving in cost.

Both switchboard transformer and portable transformer can be worked from any lighting circuit, as they consume very little current even when feeding a cautery burner with, say 20 amperes.

When ordering please state voltage and periodicity of main.

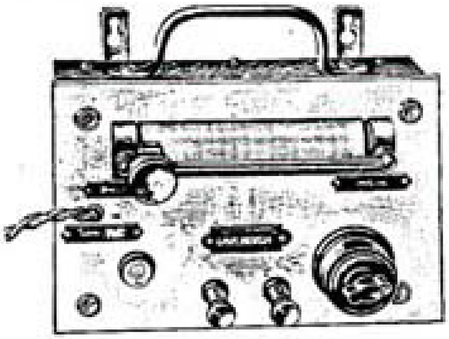
For sinusoidal switchboards see page 44. For universal machine (cautery, light, galvanic current, sinusoidal current, motor power, &c.) from alternating or continuous current main, see page 108.

Shunt Rheostats.

For Surgical Lamps.

For either Continuous or Alternating Current Main.

These little Rheostat boards are very convenient for working surgical lamps from the main. The same board can be used off either continuous or alternating main, provided the voltage is the same in each case. They only consume one or two amperes, and may therefore be worked from any existing wall socket or ordinary electric lamp-holder, either in the consulting room or at a patient's residence. They are very small, only about 9 in. × 8 in. × 4 in., and very light. Absolutely efficient and reliable.



Shunt Switchboard for Surgical Lamps, of white marble, with sliding contact wire Rheostat to regulate the current to suit the different lamps. Rheostat, of best type, wound on slate with square bar, to secure good even contact. With switch, china fuse, terminals for lamp, and flexible cable with plug for main connection. Necessary resistance wires fixed at back of board in iron frame on porcelain insulators and neatly finished off with perforated iron casing. With handle for carrying.

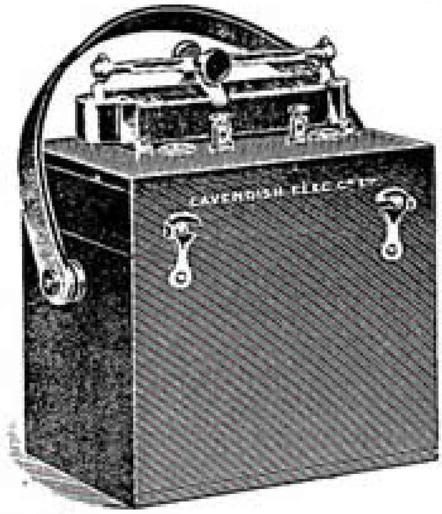
State Voltage of Main when ordering.

Order No.					
4270	For either continuous or alternating main up to 120 volts ...	£3	5	0
4272	" " " " 250 " ...	3	15	0
4276	**Solid Leather "Attaché" Case** to contain above, with spring lock and key and leather handle. Made to size ...	0	17	6

Boards fitted with incandescent lamps as resistance instead of resistance wires are a little cheaper, but they are not so efficient, while the light from the lamps is objectionable when making an examination, and out of question when carrying on transillumination.

Accumulators.

For Cautery and Light.



For Cautery purposes an Accumulator requires to be specially constructed in order to be capable of giving the very heavy amperages necessary to heat the burners without risk of buckling the plates. The cells we supply have been used for the work for a long time past, and have given every satisfaction. They are contained in a polished oak case with strap handle and hook fasteners. On top of the box is a sliding contact Rheostat to enable the amperage to be regulated to suit the different size burners. Rheostat of best design wound on slate with square bar to secure good contact.

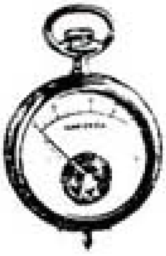
Order No.		
4300	**Cautery Accumulator**, as described, with 2 cells (4 volts) of celluloid, unbreakable. Capacity 50 ampere-hours. Size of box 8 ins. by 5 ins. by 7½ ins.	£3 10 0
4302	**Same, exactly,** but without Rheostat	2 10 0
4306	**Light Accumulator,** mounted up in the same manner, with 6 cells (12 volts) of celluloid, unbreakable. Capacity 20 ampere-hours. Size of box 8 ins. by 4 ins. by 7½ ins.	4 15 0
4308	**Same, exactly,** but without Rheostat	4 0 0
4312	**Light Accumulator,** exactly as No. 4306, but with only 4 cells (8 volts). Size of box 8 ins. by 3½ ins. by 7½ ins.	3 5 0
4314	**Same, exactly,** but without Rheostat	2 10 0
4320	**Cautery and Light Accumulator,** mounted up in the same manner, with 2 special cautery cells as with No. 4300, and with 4 light cells as with No. 4312. With 2 Rheostats. In effect this is a combination of Nos. 4300 and 4312, but the 2 cautery cells are arranged to work with the 4 light cells for surgical lamps, thus making a total of 12 volts available for lighting lamps. Size of box 8 ins. by 7 ins. by 7½ ins.	6 10 0

For cautery work a Rheostat to regulate the current is essential, and No. 4302 is only listed for the convenience of those already possessing a cautery Rheostat.

A Rheostat is very desirable for surgical lamps too, inasmuch as the various lamps one uses require different voltages from 4 to 12. Even two lamps of the same declared voltage do not always burn the same, one may be slightly dull and the other too bright and overstrained. Thus a Rheostat is always advisable, so that the current can be suited exactly to each lamp. See Rheostat, page 76.

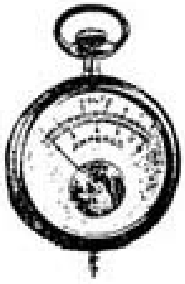
Testing Instruments.

A cell-testing voltmeter is practically indispensable to all who work with accumulators or batteries. The instrument will show when accumulators are fully charged, under which condition each cell should show 2·8 volts. Accumulators should never be discharged below 1·8 volts per cell or they become deteriorated and cannot retain the full charge as they should: in other words, their capacity is reduced A dry cell is used in the various batteries for galvanisation, faradisation, &c., and should show 1·5 volts when new. Thus a cell-testing voltmeter is of much use in telling one how his accumulators or batteries are going on. Its use would prevent the great disappointment often evinced by a doctor on finding his cautery or light accumulator run down just when wanted for a special case. It is usual to measure each ce separately: in the case of an accumulator or dry cell by merely touching the two terminals of the instrument on the two terminals of the cell. In the case of a galvanic battery by placing the terminals of the instrument on adjoining studs of the collector and so going round one by one, always missing the first stud of all, which is a blank and serves for switching the current off.



Pocket Instruments.

The point at the bottom of the case serves as one terminal. The case opens at the back like a watch, when a short flexible cord can be drawn out with a second point terminal attached.



Watch Pattern Pocket Instruments.

Nickel plated and well made. Contained in a leather purse.

Voltmeters.

Order No.		s.	d.
4850	0–3 Volts	10	6
4852	0–6 ,,	10	6
4854	0–10 ,,	10	6
4856	0–15 ,,	10	6

Ampere-meters.

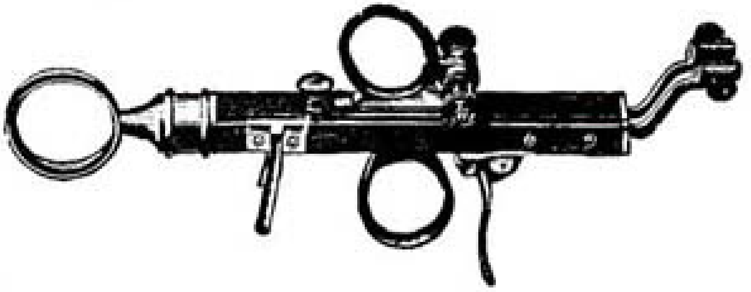
Order No.		s.	d.
4870	0–10 Amperes	10	6
4872	0–25 ,,	11	0

Combined Volt and Ammeters.

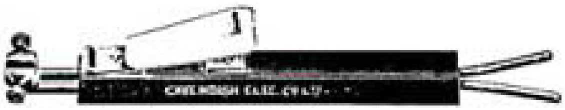
Order No.		s.	d.
4890	0–6 Volts, 0–3 Amperes	14	9
4892	0–6 ,, 0–15 ,,	14	9

Cautery.

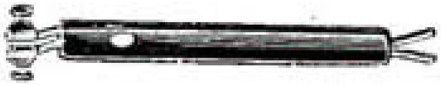
The cautery burners can be worked from the Universal apparatus listed on page 108, the motor transformers, page 46, the transformers, page 47, and the accumulators, page 49.



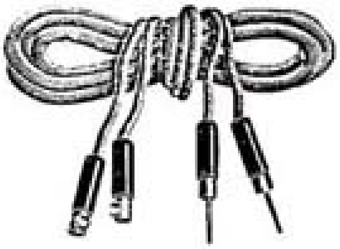
Order No.
5000 **Universal Cautery Handle by Schech.**—The Universal handle carries both burners and snares, the snare loops being drawn down by means of the sliding fitting on the top of the handle. Of polished ebonite with plated fittings. With trigger switch **£1 7 0**



5010 **Simple Cautery Handle,** for burners only. This handle is of a new and superior type. It is fitted with an infinitely better switch, offering much greater contact surface, much stronger, absolutely reliable, and not affected by sparking or wear as are the usual types. Moreover, the switch can be instantly detached, so that the two contact surfaces can be cleaned. Of polished ebonite, with plated fittings and with ivory switch **£0 17 6**

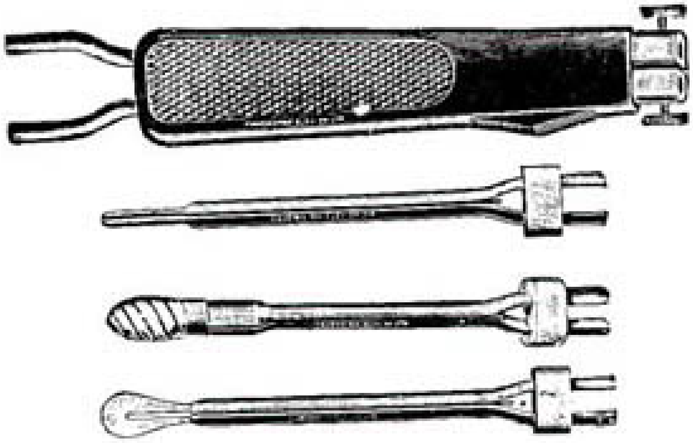


5020 **Simple Cautery Handle,** usual type, by Schech. For burners only. Of polished ebonite, with plated fittings, and usual press-button switch. Best make **£0 12 6**

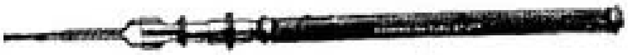


5080 **Cautery Cords.** Heavily rubber-insulated, and contained together in one cover of red silk. Copper stranded wire to carry the heaviest currents, yet flexible. With polished ebonite and plated metal terminals. Length 5 ft. **£0 5 6**

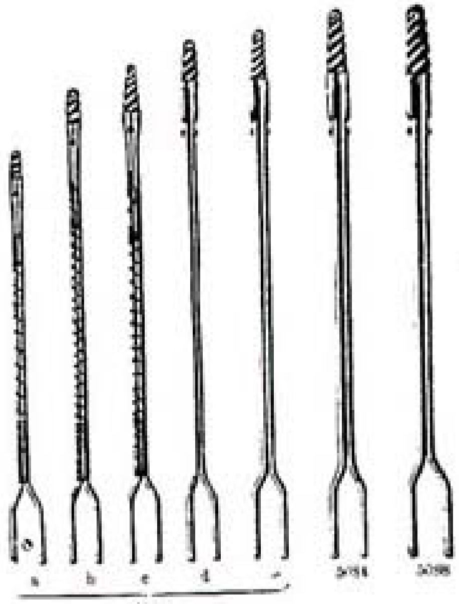
Cautery.



Order No.		
5040	**Simple Cautery Handle,** specially made for burners taking exceedingly heavy currents, up to 50 amperes, for gynæcological operations. The ordinary burner only takes between 10 to 25 amperes. Of polished ebonite, plated fittings, with strong switch	£1 10 0
5042	Pointed platinum burner for above	0 18 0
5044	Knife-shaped platinum burner for above	0 18 0
5046	Large porcelain burner for above	1 1 0
5048	Extra stout cautery cords for above...	0 10 0



5060	**Handle** for carrying small burners, for eye, &c.	£0 15 0



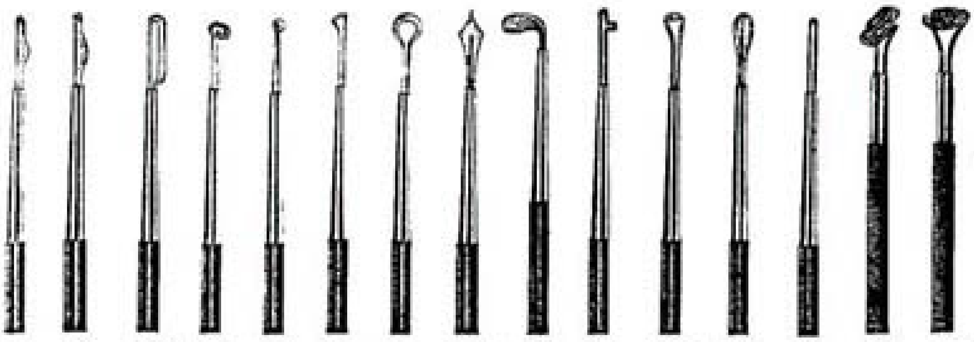
Porcelain Burners.

Best quality, well and strongly made. The larger ones have an insulating division of fibre.

Order No.			s.	d.
5080	A. B. C. D. E.	each	4	6
5084	Medium	... ,,	5	3
5088	Large ...	... ,,	7	3

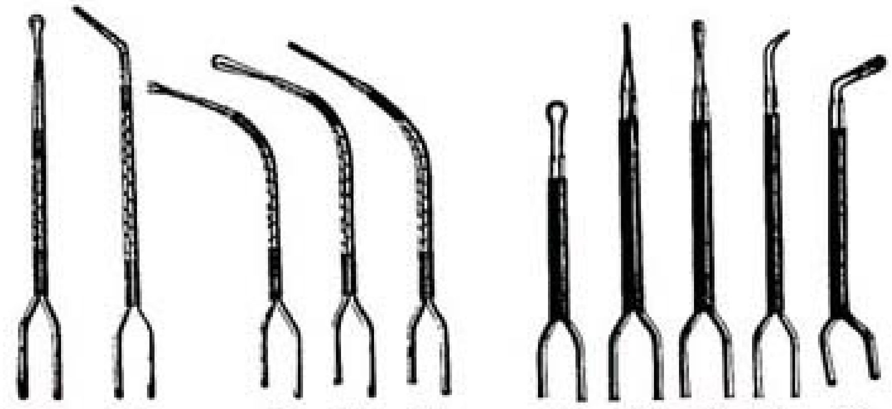
The approximate lengths are :—
5080 A, 4 in., B and C, 4½ in., D and E, 5 in., 5084 and 5088, 6½ in.

Cautery.


5100
5101
5102
5103
5104
5105
5106
5107
5108
5109
5110
5111
5112
5113
5114

Platinum Burners are made in a great variety of shapes, but those illustrated above represent the patterns most generally in use, and will be found to meet all ordinary requirements. Nos. 5100, 5107, 5110, 5111 and 5112 are the most frequently ordered All have strong well made platinum points on good stems. The stems can be supplied to any length and shape, but Order No. 5180 illustrates the three usual. A is about 7 in. long, and B and C about 5 in. B is the most popular shape stem of all, and burners will be supplied to this shape unless otherwise ordered.

Prices: **3/3** each, except No. 5103, **4/6**; 5104, **4/10**; 5113 and 5114, **6/6** each.


No. 5130
5131
5132
5133
5134
5150
5151
5152
5153
5154

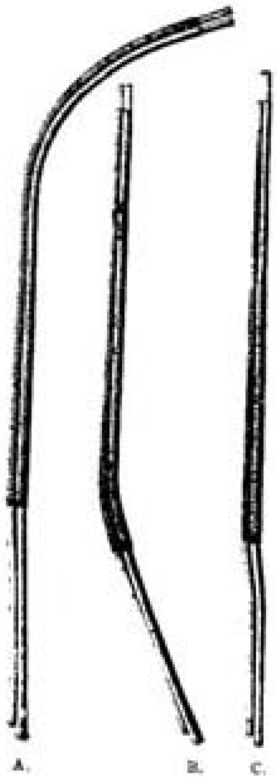
Platinum Burners, Small, for eyes, ears, nose, &c.; length about 2½ inches, unless otherwise ordered.

Prices: **2/3** each.

Small Snare Tubes, corresponding, listed following page.

All Burners on this page fit either handle, page 51.

Cautery.



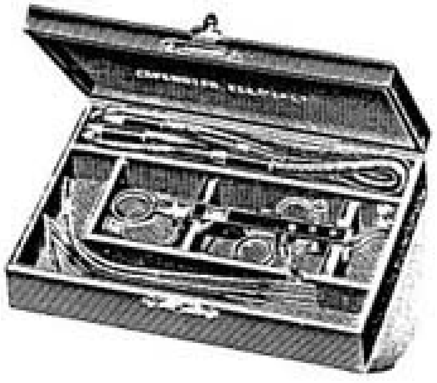
Snare Tubes.

Snare tubes can be supplied to any length and shape desired, but the illustration represents the three shapes usually taken, the same as with burners. For that matter either burners or snare tubes can easily be bent by the Doctor to any shape required.

Order No.		s.	d.
5180 A B C	... ... each	3	0

Small Snare Tubes, corresponding to the small burners listed on previous page, length about 2½ in. unless otherwise ordered.

Order No.		s.	d.
5190 A B C	... ... each	2	0



Order No.				
5200	**Cautery Case**, containing: 1 universal handle (No. 5000); 7 assorted burners for larynx, nose, ear, &c.; 1 snare tube for larynx (No. 5180A): 1 snare tube for nose, &c. (No. 5180B or *c*); and wire for snares; case in highly finished walnut or oakwood with fastener	£3	5	0
5204	**Same**, with cautery cords No. 5030 in addition (Fig.)	3	10	0
5210	**Cautery Case**, containing: 1 Universal handle (No. 5000); 4 assorted burners for larynx, nose, ear, &c.; 1 snare tube (No. 5180A); 1 snare tube (No. 5180B or *c*): and wire for snares. Case highly finished in walnut or oakwood with fastener	2	15	0
5214	**Same**, with cautery cords No. 5030 in addition	3	0	0

Any case with handle No. 5010, 9s. 6d. less, or handle No. 5020, 14s. 6d. less.

Cystoscopes.

Our line of Cystoscopes has recently been very greatly improved, notably by a **completely new system of prisms by Carl Zeiss**, which produce by refraction only successive inversions of the image as formed by the objective, with the result that the image is presented to the eye in **erect form** and **not upside down** as was the case with the earlier instruments. Moreover, the repeated inversion of the image constitutes a very advantageous means of increasing the diameter of the pencil of light which reaches the eye without cutting down the field of view.

These optical parts are made by Carl Zeiss, in accordance with rigorously computed data, calculated to provide the very highest degree of excellence and uniformity of results. Owing to the extreme care taken and the difficulties of construction, Cystoscopes fitted with the Zeiss optics are naturally more costly than those of the usual type, but even so the prices do not exceed reasonable limits, while the advantages gained are invaluable.

The objectives are free from defects in definition, such as astigmatism and coma. As is the case with all single and comparatively thin condensing lenses, the field is curved in accordance with the laws of Coddington and Petzval, but in view of the natural curvature of the bladder it is of no practical significance. It is more noticeable when flat objects are being viewed, since it is not, as in older types of instrument, masked by excessive stopping down.

In general the instruments are all of the very highest class, equally perfect in design, construction and finish.

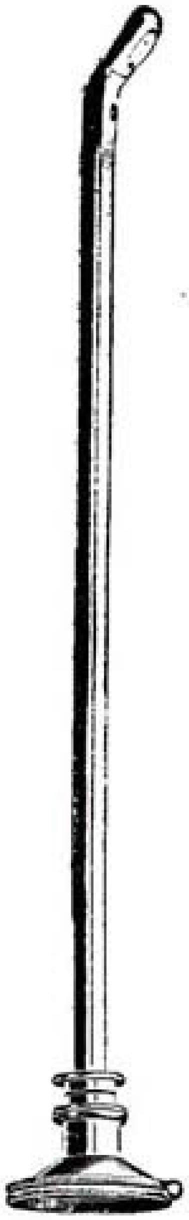
They are provided with a new form of contact for connecting the conducting cable. These contacts slip readily on to the Instrument and can be easily detached. A good contact is secured while yet permitting perfect freedom of movement of the Cystoscope. For these reasons, no less than because it is more in accordance with the requirements of aseptic surgery, we have entirely given up the usual forms of contact.

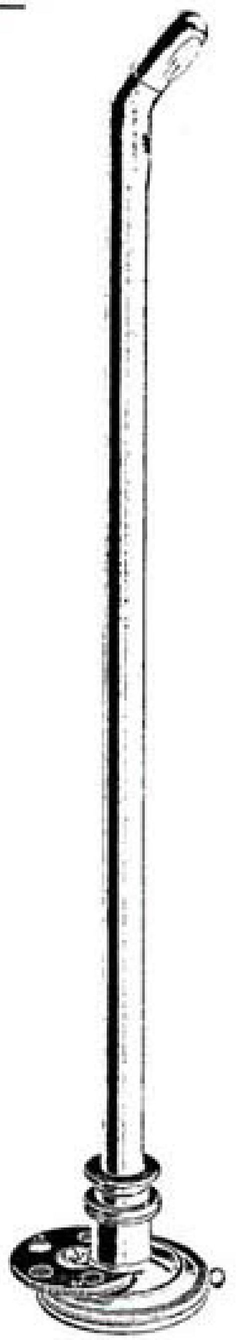
In every detail the instruments are perfect. They are made by specialists who have confined their attention to their manufacture for years past. All the advantages of such experience, combined with scientific knowledge, are brought to bear upon their design, while the greatest accuracy is strictly observed in every detail of their construction.

The outcome is a range of Cystoscopes representing the highest degree of excellence possible,

giving a very large field of view, with brightest illumination and the utmost clearness and sharpness of definition.

Cystoscopes.





Penetration.

. . . . . . it was pointed out that owing to the small diameter of the emerging pencil in the older instruments objects situated at greatly varying distances came all into view at once with tolerable distinctness. Instruments of this kind are generally said to have a great "depth of focus" or penetration. The quality of penetration naturally diminishes in a measure as the light transmitting power is increased; nevertheless it is present in a sufficient degree in the optically powerful cystoscopes which we have introduced, provided the observer has a range of accommodation of 2 diopters. In the case of observers of more advanced age, say over 55 years of age, the necessary degree of accommodation can be restored artificially by means of a revolving spectacle disc which has been devised and patented by Carl Zeiss.

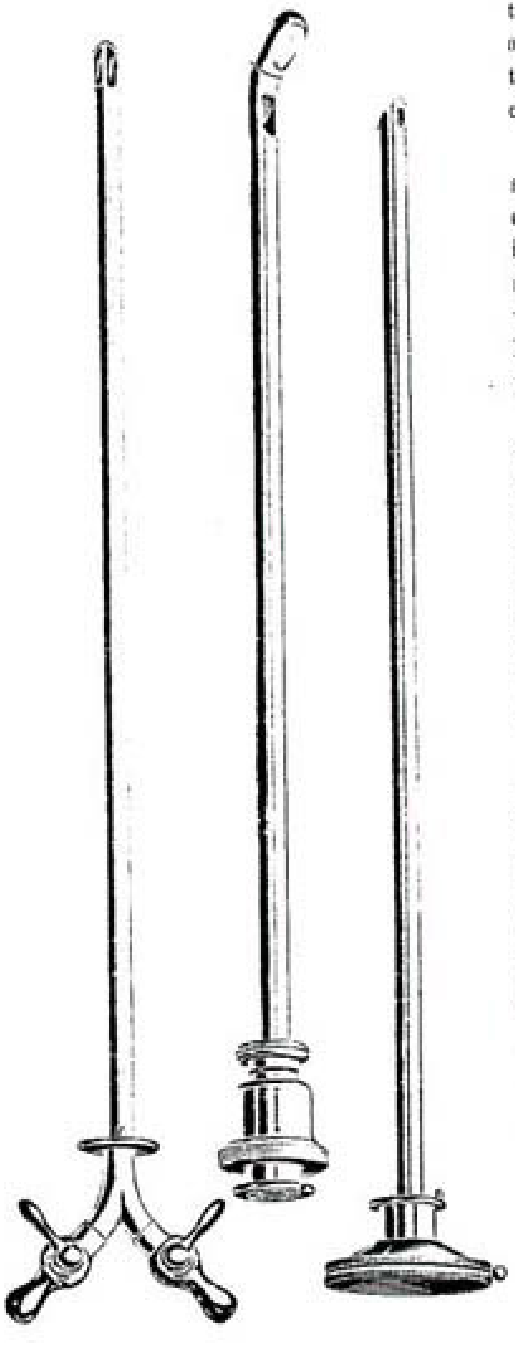
Cystoscopes.

Order No.				
5500	**Cystoscope by Professor Nitze,** in sizes from 12 to 21 Charrière. Complete in polished wood case with spare lamp, and with silk covered connecting cable with special contact	£3	15	0
5502	**Same,** but arranged to give a picture erect and right-sided ...	4	5	0
5506	**Cystoscope by Dr. Ringleb,** with new optical system by Carl Zeiss, giving a non-inverted image, as referred to on page 55. Diameter 7 mm. or No. 21 Charrière. Magnification 1.9; Diameter of field of view 34 mm. By reason of its extremely great visual angle and its great penetration, this model is particularly adapted for rapid localisation. It provides a field of normal brightness. Complete in polished wood case with spare lamp, and with silk covered connecting cable with special contact	6	0	0
5510	**Cystoscope by Dr. Ringleb,** with new optical system by Carl Zeiss, giving a non-inverted image. Diameter 7 mm. or No. 21 Charrière. Magnification 3.0; Diameter of field of view 26 mm.	6	0	0
5512	**Same as No. 5510,** but fitted with revolving spectacle disc for operators of more advanced age, say over 55, as referred to on previous page	7	10	0
	Having a field embracing an air angle of 75° and furnishing a considerable magnification, this model is available both for localising features in the bladder and for bringing them distinctly into view. The instrument requires accurate adjustment with respect to the standard focal distance.			
5516	**Cystoscope by Dr. Ringleb,** with new optical system by Carl Zeiss, giving a non-inverted image. Diameter 7.6 mm. or No. 23 Charrière. Magnification 4.6; Diameter of field of view 22 mm.	6	0	0
5518	**Same as No. 5516,** but fitted with revolving spectacle disc, as referred to on previous page	7	10	0
	Thanks to its air angle of 65° and its great magnifying power, this model provides views of exceptional beauty. It requires to be accurately adjusted with respect to the standard focal distance.			

N.B.—In each case the magnification is taken with the standard focal distance as 25 mm. in water. The diameter of field of view is taken as object at standard focal distance.

Cystoscopes.

Irrigation Cystoscopes.



The mechanical development of the rinsing cystoscopes has been due to the natural desire to replace the imperfect methods previously adopted of closing the irrigator tube with the thumb or with a stop cock, &c., by more efficient means.

The first methods were duly supplanted by sliding valves and eccentric closing devices, and these in turn have been superseded quite recently by the automatic valve, which, though conceived years ago, has only now reached the stage of perfection.

The Ringleb Valve works with absolute precision and can be depended upon after long use. It is fitted with a powerful spring of non-oxidizable metal. For the first time this valve provides a really satisfactory means of exchanging the mandrels, and it has now become an essential fitment of all Irrigation Cystoscopes.

All types of rinsing cystoscopes are provided with a short nipple attachment for the tubes and a patented form of double catheter for introduction into the cystoscope case. The small tube attachment is eminently useful for central irrigation and for evacuating the bladder. In cases presenting special difficulties, as in Vesicular Hæmorrhage, the double current catheter will be found very useful. It allows of fluids entering the bladder and at the same time a discharge from it. By this means the quantity of fluid in the bladder may be kept nearly constant and thus the pressure prevented from varying excessively.

Cystoscopes.

Irrigation Cystoscopes, by Dr. Ringleb, consisting of 4 main parts, viz.: (1) The cystoscope case, fitted with the lamp at one end and the automatic closing valve, by Dr. Ringleb, at the other. (2) The tube fitted with the optical system. (3) The double irrigation tube with 2 taps. (4) The short irrigation tube (non-circulatory), not illustrated.

Complete in polished wood case with spare lamp and with silk covered connecting cable with special contact.

Order No.		
5580	With optical system of Dr. Ringleb, by Carl Zeiss..	£7 10 0
5582	With optical system of Prof. Nitze, in sizes from 12 to 23 Charrière	5 10 0
5584	Same, but arranged to give a picture erect and right-sided	6 0 0

For investigation purposes the optical tube is first inserted into the cystoscope case and the instrument then introduced. If irrigation be desired, the optical tube is withdrawn, and in its place, either the short irrigation tube or the double irrigation tube is inserted. Thus the cystoscope case remains undisturbed.

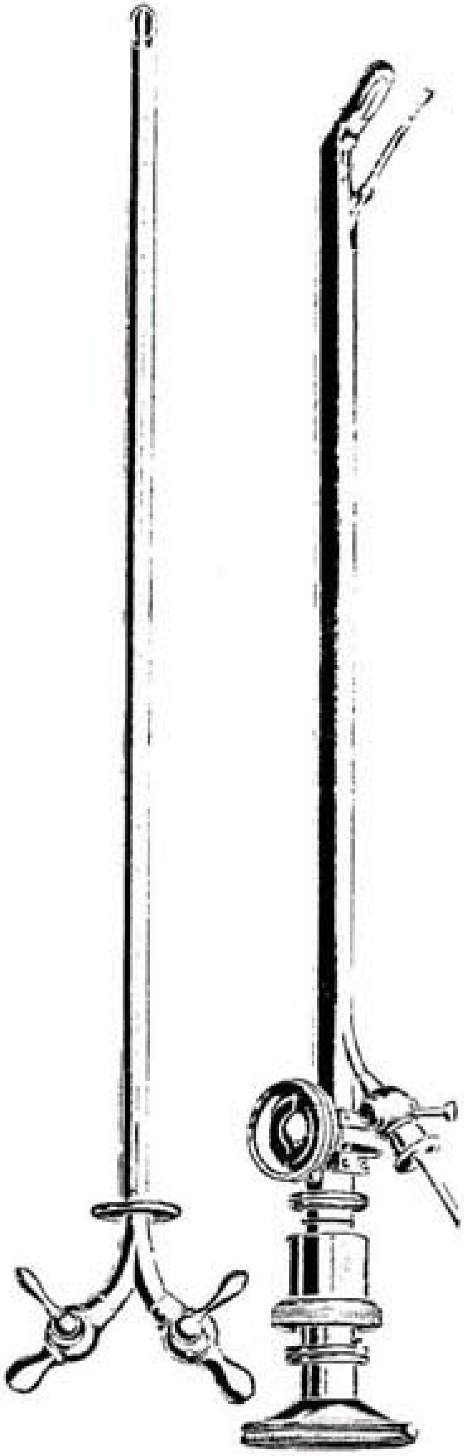
The short irrigation tube, with its large bore, serves for filling and emptying the bladder very quickly. The double irrigation tube permits the filling of the bladder or a continuous circulation.

On withdrawing any of the tubes, the automatic closing valve, by Dr. Ringleb, prevents the escape of the fluid.

This model may be described as the embodiment of all that has been achieved in the endeavour to produce an ideal irrigation cystoscope. Many authorities have actually referred to it as the perfect instrument.

The diameter of No. 5580 is 7 mm. or No. 21 Charrière's scale. Magnification 2.3, the standard focal distance being 25 mm. in water. Diameter of field of view, the object being at the standard focal distance, 20 mm.

Cystoscopes.



Single Ureteral and Irrigation Cystoscope, with automatic closing valve by Dr. Ringleb. With double irrigation tube, with 2 taps and with short irrigation tube, referred to on page 58 (not illustrated). A tap is fitted to the entrance tube for the ureteral catheter to prevent the fluids from flowing out when catheter is not in use. The milled knob shown in illustration is for operating the guide for the catheter, thus controlling the angle of the catheter in relation to the cystoscope.

Complete in polished wood case with spare lamp, silk covered connecting cable with special contact, and best quality flexible catheter.

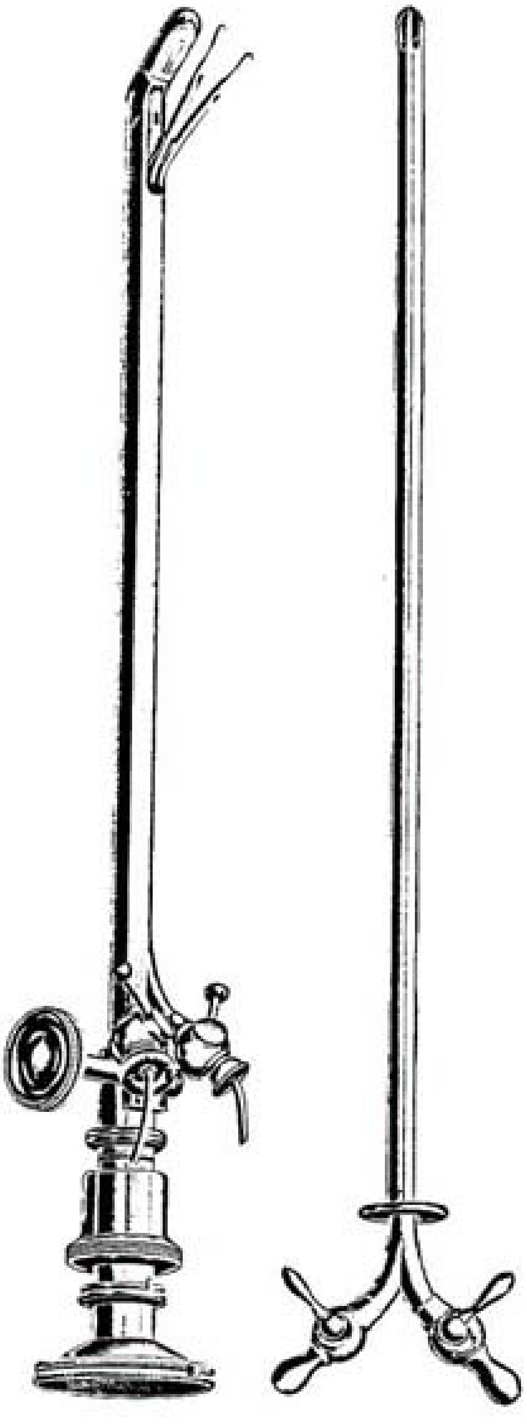
Order No.				
5540	With optical system of Dr. Ringleb, by Carl Zeiss ...	£9	5	0
5542	With optical system of Prof. Nitze ...	£7	0	0
5544	Same, but arranged to give a picture erect and right-sided	£7	10	0

Cross section of the cystoscope 8.30 : 6.30 mm. or No. 22 Charrière's scale.

Magnification of No. 5,540, 2.3 the standard focal distance being 25 mm. in water.

Diameter of field of view, the object being at the standard focal distance, 20 mm.

Cystoscopes.



Double Ureteral and Irrigation Cystoscope, with automatic closing valve by Dr. Ringleb. With double irrigation tube with two taps and with short irrigation tube referred to on page 58 (not illustrated). Taps are fitted to the entrance tubes for the ureteral catheters to prevent the fluids flowing out when catheters are not in use. The milled knob is for operating the guide for the catheters, controlling their angle in relation to the Cystoscope.

Complete in polished wood case with spare lamp, silk covered connecting cable with special contact, and two best quality flexible catheters.

Order No.		£	s.	d.
5550	With optical system of Dr. Ringleb by Carl Zeiss ...	10	0	0
5552	With optical system of Prof. Nitze	7	15	0
5554	Same, but arranged to give a picture erect and right-sided ...	8	5	0

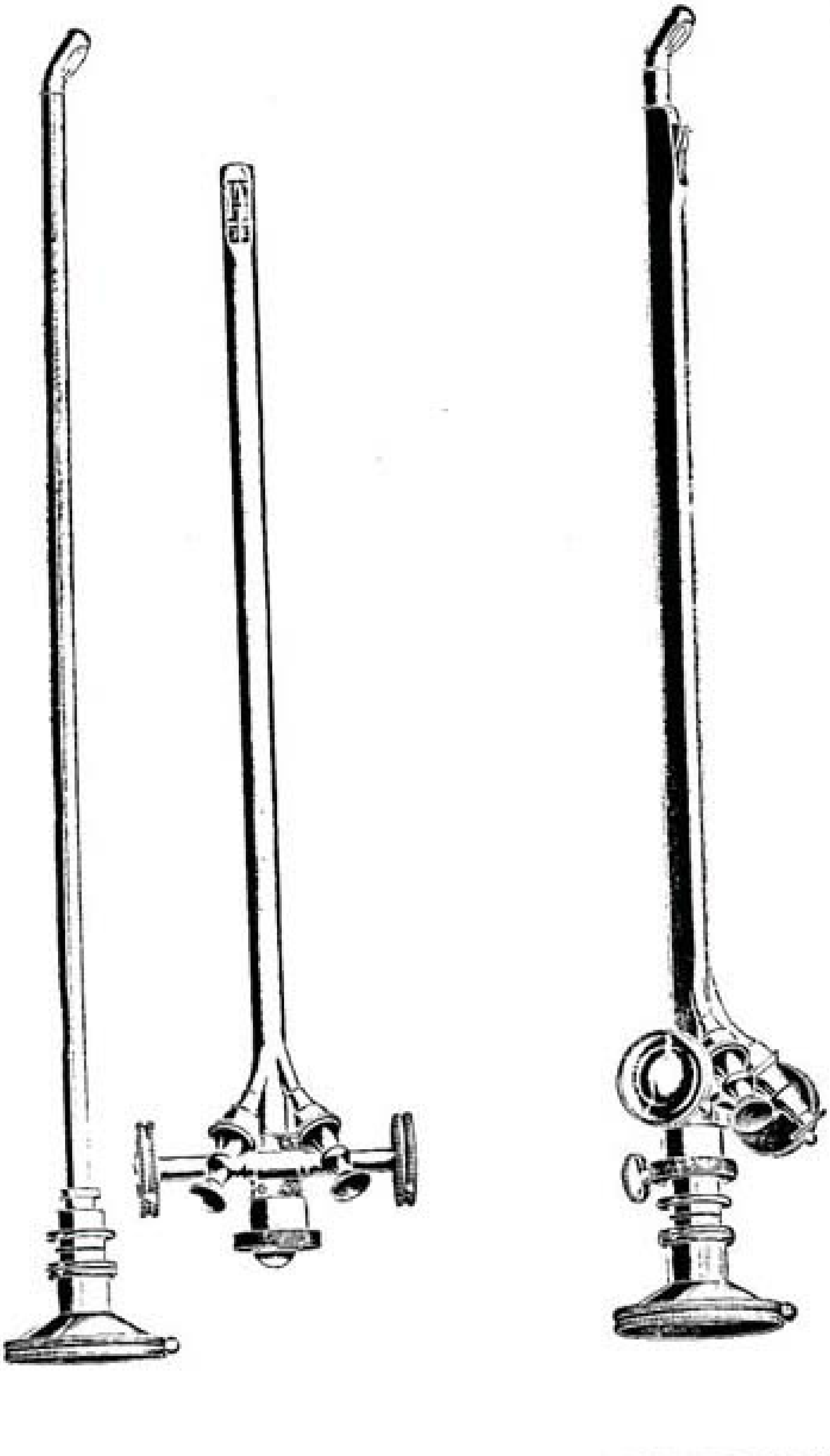
Cross-section of the Cystoscope 8.40 : 6.30 mm. or No. 22 Charrière scale.

Magnification of No. 5550, 2.4 the standard focal distance being 25 mm. in water. Diameter of field of view, the object being at the standard focal distance, 20 mm.

The construction of this Cystoscope is similar to that of No. 5540. The two ureteral catheters are pushed forward on either side of a divisional wall, which protects the catheters from rubbing against one another. Whilst using self-retaining catheters the optical attachment should be removed so as to render the entire bore available for the accommodation of the catheters. This renders it easy to advance them whilst the operator withdraws the instrument.

Cystoscopes.

Double Ureteral Cystoscope by Dr. Bierhoff.



Cystoscopes.

Combined Single Ureteral and Irrigation Cystoscope. This instrument constitutes a combination of No. 5530 and No. 5540, and to the surgeon about to purchase two such instruments separately offers a saving of some £3 or £5, according to the optical system. This is brought about by dispensing with one of the optical tubes. Although as a general principle the optical tube requires to be specially adapted to suit each given purpose it so happens that in the case of the ureteral and rinsing cystoscopes it is available for both purposes.

The cross section of the ureteral cystoscope is 8.30 × 6.50 mm., or No. 22 Charrière. The diameter of the rinsing cystoscope is 6 mm., or No. 18 Charrière. The diameter of the optical tube is 5 mm., or No. 15 Charrière.

Complete in polished wood case, with double irrigation tube, short irrigation tube (neither illustrated), with 4 lamps, silk covered connecting cable, with special contact and with best quality flexible catheter.

Order No.				
5570	With optical system of Dr. Ringleb, by Carl Zeiss	£11	5	0
5572	With optical system, by Prof. Nitze	9	0	0
5574	Same, but arranged to give a picture erect and right-sided ...	9	10	0

Magnification of No. 5570, 2.4, the standard focal distance being 25 mm. in water. Diameter of field of view, the object being at the standard focal distance, 20 mm.

Double Ureteral Cystoscope, by Dr. Bierhoff.

The mechanical fittings of this instrument with the exception of the optical tube may be sterilised by boiling. The instrument offers great advantages when used with self-retaining catheters, as it does not turn about its axis whilst being withdrawn and so does not cause the catheters to twist. The optical attachment may be used independently as an exploring cystoscope.

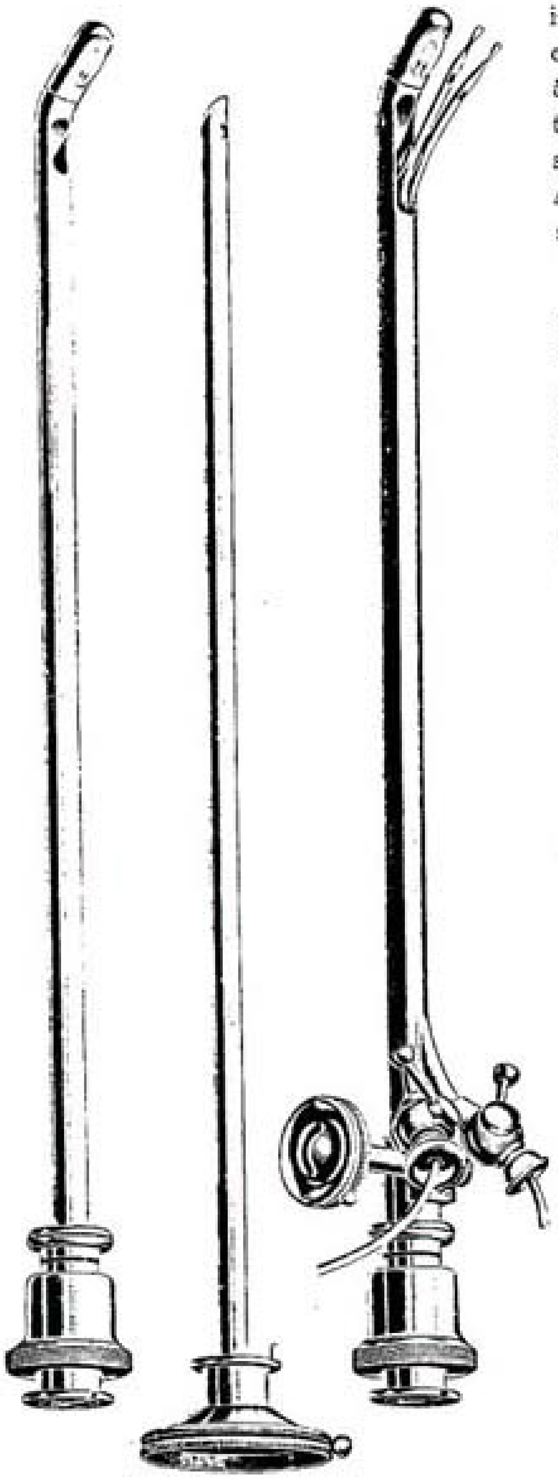
The cross section of the cystoscope is 8.60 × 6.70 mm., or No. 23 Charrière scale. Diameter of the optical tube 5.60 mm., or No. 17 Charrière.

Complete in polished wood case, with 2 bent lamps, and with silk covered connecting cable with special contact.

Order No.					
5580	With optical system of Dr. Ringleb, by Carl Zeiss		£9	15	0
5582	With optical system, by Prof. Nitze		7	10	0
5584	Same, but arranged to give a picture erect and right-sided ...		8	0	0
5600	Straight lamps	each	0	3	0
5604	Bent lamps	,,	0	3	6
5608	Straight lamps, metal filament	,,	0	3	6
5612	Bent lamps ,, ,, ...	,,	0	4	0

Magnification of No. 5580, 2.3, the standard focal distance being 25 mm. in water. Diameter of field of view, the object being at the standard focal distance, 20 mm.

Cystoscopes.



Combined Double Ureteral and Irrigation Cystoscope. This is an instrument constituting a combination of No. 5530 and No. 5550, and to the surgeon about to purchase two such instruments separately offers a saving of some £3 or £5, according to the optical system.

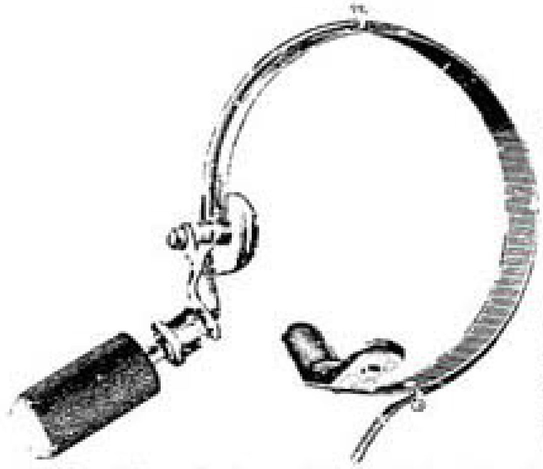
One optical tube serves for use with the two cystoscopes. The cross section of the ureteral cystoscope is 8.40 × 6.20 mm., or No. 22 Charrière. The diameter of the rinsing cystoscope is 6 mm., or No. 18 Charrière scale. The diameter of the optical tube is 5 mm., or No. 15 Charrière scale.

Complete in polished wood case. With double irrigation tube, short irrigation tube (neither illustrated), with 4 lamps, silk covered connecting cable with special contact, and with two best quality flexible catheters.

Order No.		
5560.	With optical system of Dr. Ringleb, by Carl Zeiss ...	£12 0 0
5562.	With optical system of Professor Nitze...	£9 15 0
5564.	Same, but arranged to give a picture erect and right-sided	£10 5 0

Magnification of No. 5560 2·4, the standard focal distance being 25 mm. in water. Diameter of field of view, the object being at the standard focal distance, 20 mm.

Surgical Lamps.



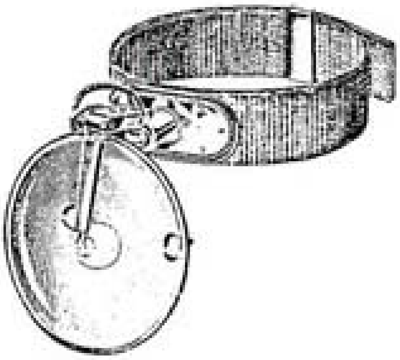
Forehead Lamp.

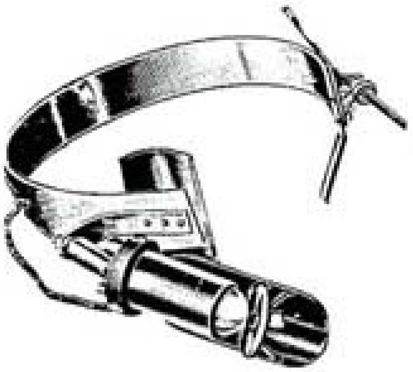
This is the best class forehead lamp manufactured. The band is of steel which is universally preferred to bands of celluloid and webbing. Leather covered pads are fitted for the forehead and back of head.

The bulb itself has a metal filament which gives a much brighter light with less current than the old carbon filaments, and at the same time generates no heat. A ball joint enables the lamp to be adjusted as desired.

By sliding the lens tube back the illuminated area is increased and the light diffused, while if drawn forward the area is decreased and the light concentrated. A parallel beam of light can also be obtained and the light is bright and homogeneous.

Order No.		
5650	Including 1 spare metal filament lamp, and the whole contained in good plush lined case	£1 14 0
5654	**Silk covered cord** with special ebonite and metal terminals to connect with the short cord with socket attached to the lamp. Length about 5 ft.	0 5 6





Head Lamp, by Dr. Klar, with concave mirror about 4 ins. diameter. The arm carrying the bulb can be moved towards or from the mirror to permit of a regulation of the light. The mirror itself is also adjustable and can be used as an ordinary reflector.

Including 1 spare metal filament bulb and in case.

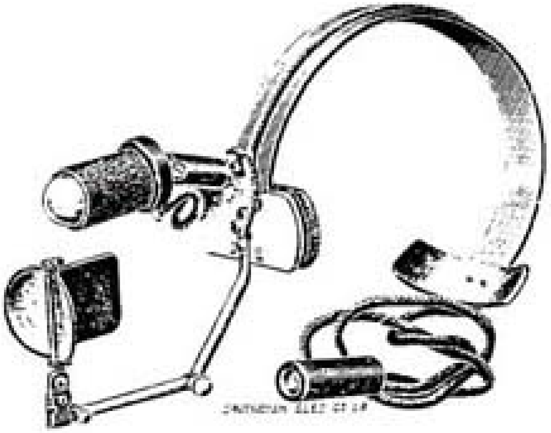
Order No.		
5660	With band, by Dr. Jansen (Fig.)	£2 4 0
5664	With plated steel band	2 6 0

Head Lamp, by Dr. Kirstein, adjustable in all directions. In front of the lens is a mirror, placed at an angle and provided with a central aperture so that the eye sees parallel with the beam of light, an advantage when examining narrow passages, such as the ear, etc.

Including 1 spare metal filament lamp and in case.

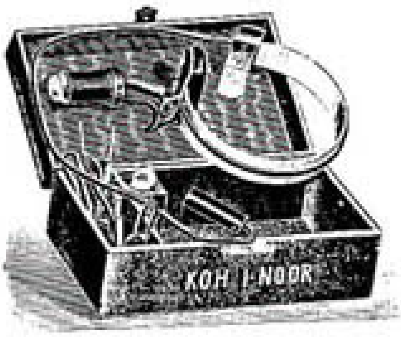
Order No.		
5670	With plated steel band (Fig.)	£1 18 0
5671	With band, by Dr. Jansen	1 16 0

Surgical Lamps.



Forehead Lamp.

Special Type.



This Forehead Lamp is manufactured in great quantities with a view to effecting a saving in price. It is particularly light and neat. The lamp part can be adjusted to any position by a ball joint and a second hinge joint. The band is of white celluloid, with leather covered forehead pad and aluminium cross-piece for back of head. The lens tube slides backwards and forwards over the lamp as usual for modification of the light and area covered.

Complete with silk covered cord, with ebonite and metal terminals, total length 7 feet. With metal filament lamp, one spare metal filament lamp, and the whole in good plush-lined case—

Order No.		
5680	**£1 15 0**	with cable.

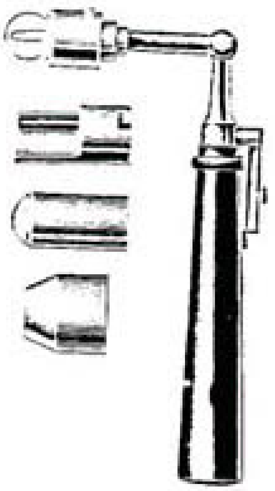
Stereoscopic Lens Attachment. This is a new idea intended more especially for examination of the eye and for localising foreign bodies in the eye. The fitting can be attached to lamp No. 5680, as illustrated above, or it can be fitted to any other suitable Head Lamp, such as No. 5650, &c. Four distinct adjustments are provided. The carrying stem is hinged in the middle with screw for fixing. The lens fitting itself telescopes into the end of the carrying stem and revolves. The double lens tilts backwards and forwards, while the metal plate behind same is arranged to move sideways.

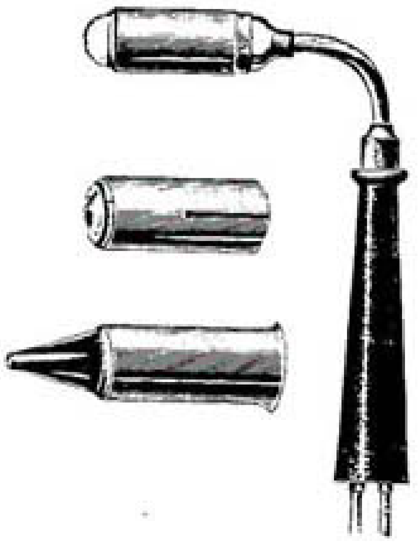
Thus every adjustment is provided, quite over and above the adjustments of the head lamp itself.

The attachment can be fitted to any lamp very easily.

Order No.	
5684	**£1 2 6**

Surgical Lamps.





Hand Lamp, by Dr. Heryng, for illumination of mouth and for trans-illumination of the jaw and forehead hollows. With lens tube, with tongue depressor, and with india rubber mantle. The handle is of polished wood and is fitted with a switch. The whole of best make and highest finish.

A very popular lamp of great convenience and utility.

Order No.				
5700	Including 1 spare lamp and in plush lined case	£2	5	0
5702	Same lamp with tongue depressor only, without case and spare lamp	1	17	6
5704	Same lamp with lens tube only	1	17	6

Hand Lamp, by Prof. Hirschberg, for ophthalmic purposes. With slide-on lens tube for general illumination. Handle of polished wood fitted with switch. Best make and finish.

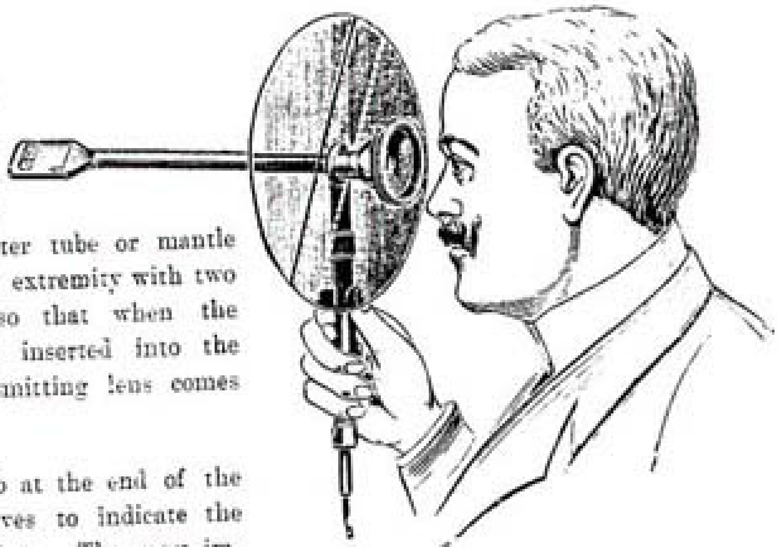
A very useful and efficient lamp universally in use.

Order No.				
5720	Including 1 spare lamp and in plush lined case	£2	2	0
5722	**Lens Tube** to slide over the lens tube included with the lamp. To create a powerful light on a small area. Providing a very clear bright light without any reflection of the lamp filament ...	0	8	6
5724	**Tube with 3 lenses,** especially for recognising foreign bodies, for diseases of the retina, for transillumination of the walls of the eye, and for recognising swellings, &c. The point can be screwed off and used by itself as a strong magnifying lens for examination of cornea, while the fitting itself, after removal of the point, can be used for the after-cataract operation. The point offers the particular advantage that reflections of light are entirely obviated, and it is therefore especially suitable for examination of the macular region	1	5	0
5740	**Carbon Filament Lamps** for either of above ... ... each	0	2	6
5744	**Metal Filament Lamps** for either of above ... ... each	0	3	6

The advantages of the latter are that they provide a much brighter light with less current and with very little heat, whereas the carbon lamps generate great heat. The metal filament lamps are therefore to be preferred in every way, especially for cavities, where heat is always objectionable.

Pharyngoscope.

By Dr. Flatau.



This new Pharyngoscope is a very convenient and efficient instrument, and is being universally adopted. The outer tube or mantle is provided at its extremity with two electric lamps, so that when the optical tube is inserted into the mantle the transmitting lens comes between them.

The little knob at the end of the optical tube serves to indicate the position of the lens. The most important point in connection with the use of this Pharyngoscope is very careful insertion. It should be inserted almost as far as the pharyngeal wall, the patient closing his mouth and breathing naturally through his nose. Depress the tongue and keep the lamp firmly in position, taking care that it does not touch the pharyngeal wall, and with the muscles relaxed as much as possible.

When the knob (and therefore lens) of the optical tube is upwards the pharyngeal vault may be examined, and the posterior nares brought into view by slightly depressing the handle. If turned to one side the Eustachian tube can be seen, and it is very easy to observe a suitable catheter in position. When the lens is turned downwards the larynx, epiglottis and vocal cords come into view.

By means of the special optical system adopted this Pharyngoscope gives a **Direct Image**, *i.e.*, **Non-Inverted**, with brilliant illumination and powerful magnification.

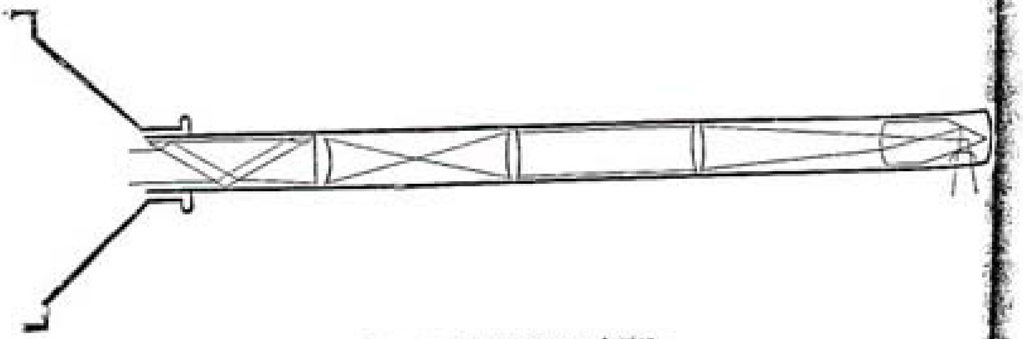
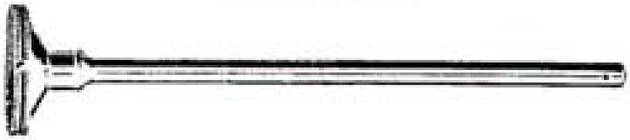
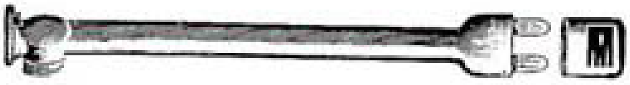


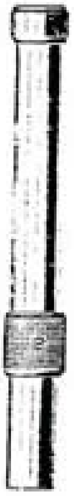
Diagram showing optical device.

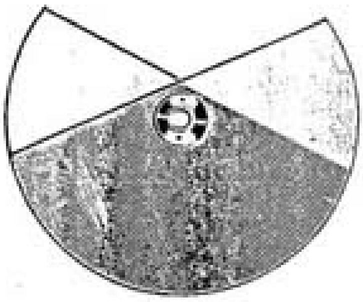
Pharyngoscope.

By Dr. Flatau.









Prices.

Pharyngoscope by Dr. Flatau, consisting of outer tube carrying the two lamps, with two covers for fitting over the lamps, one having windows on both sides for examination in both directions and the other having only one window, this latter for viewing either up or down according to how it is placed on. Optical tube as illustrated on previous page. Handle to screw on to outer tube and provided with a sliding switch.

The whole of the highest class and contained in polished satin walnut case, with connecting cords to suit.

Order No.				
5746	... ...	£3	15	0

5747	Spare metal filament lamps for above ... ... Each	£0	3	0
5748	Spare carbon " " " ... ... "	0	2	6
5749	Dry cell battery for above in leather case	0	5	0
5750	" " without leather case	0	1	6

The Pharyngoscope can, of course, be worked from the mains by means of suitable switchboard, etc., or from accumulators or batteries.

Order No.				
5751	**Celluloid guard**, as illustrated above, to fit on to the optical tube, and detachable. In two halves so that it may be used as a complete circle or down to half circle. To protect the operator's face from the patient's breath, etc.	£0	5	0

Anastigmatic Magnifying Laryngeal Mirror

as suggested by Dr. W. Brunings.

Acting upon the suggestion of Dr. W. Brunings, a magnifying laryngeal mirror has been devised (Fig. 1) which is as simple to use as an ordinary plane mirror. It has, however, the advantage that it shows the larynx magnified about 1½ times, so that details may be recognised without difficulty. At the same time all parts of the image appear distinct, whilst the field of view is cut down by quite an insignificant amount by the introduction of the element of magnification.

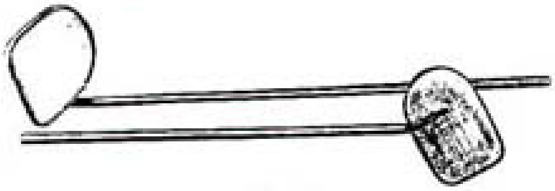


Fig. 1.

To obtain a magnified image of the larynx by means of reflection it is necessary to employ a concave mirror, and to secure a good view and proper lighting the mirror requires to be held so that its axis may be inclined at an angle of about 45° to the line of sight in either direction. Such a pronounced obliquity of the incident rays as received by an ordinary concave mirror is inevitably attended with an amount of astigmatic distortion which completely destroys the utility of the image. Under these circumstances a concave mirror would show details less clearly than a non-magnifying plane mirror. We have accordingly overcome this defect in such a manner that the mirror is anastigmatic in the position in which it is used, but it should be noted that these defects can be corrected with respect to this one position only. For this reason the mirror is made in the shape of a tile, which renders it easy to maintain the correct position. When the mirror is placed with its short and straight edge approximately horizontal an observer having his eye on a level with the mirror will see of an object situated vertically below it a magnified image clearly defined in every part.

The Laryngeal Mirror is made in two sizes, the smaller one being 20 mm. wide and 26 mm. high, whilst the larger one is 25 mm. wide and 28 mm. high. The larger mirror is available for use with adults and has a larger field of view than the smaller pattern. The magnification is the same in both cases.

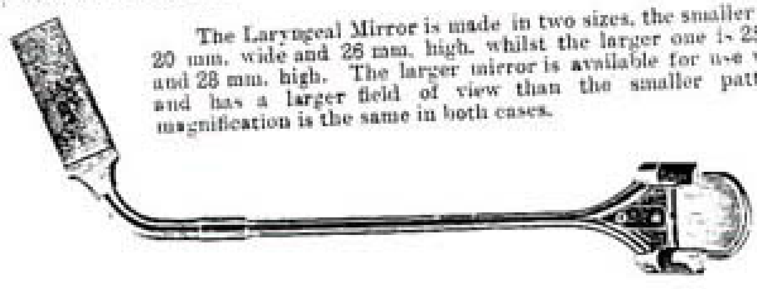


Fig. 2.

In view of the tile shape of these mirrors we supply patterns for right hand and left hand use. They are set in watertight mounts of nickle-plated German silver and may be boiled in the water-bath without damage to the silvering.

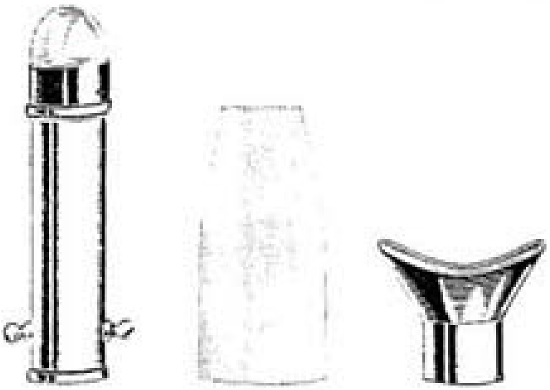
Brünings' Anastigmatic Magnifying Laryngeal Mirrors may also be supplied in Dr. H. Mayer's mirror holder, as shown in Fig. 2. The mirror holder contains two small illuminating lamps fitted with screens so as to keep all disturbing light off the observer's eyes. The mirror handle is made to rotate, which renders the instrument available for use in either hand. The milled end of the handle revolves and switches the current on and off.

Prices.

Order No.		£	s.	d.
5753.	Laryngoscope, consisting of Bruning's Magnifying Anastigmatic Laryngeal Mirror 20 by 26 mm. mounted on Dr. Mayer's lamp, as described above. Complete with 2 lamps, flexible connecting cable and in leather covered, plush lined case with tube of Lasin ...	£2	2	0
5754.	4 Volt dry battery for above lamp, in leather case ...	0	5	0
5755.	4 Volt dry battery, without case ...	0	1	6
5756.	4 Volt metal filament lamp for above ...	0	3	0
5757.	4 Volt Carbon filament lamp for above ...	0	2	6
5758.	Brunings' magnifying anastigmatic laryngeal mirror, 20 by 26 mm. ...	0	6	0
5759.	Same, but 25 by 28 mm. ...	0	7	0

When ordering Anastigmatic Laryngeal Mirrors kindly state whether the mirrors are required for right or left hand use. In the absence of any particulars we shall send mirrors adapted for use in the right hand, as shown in Fig. 1.

Surgical Lamps.

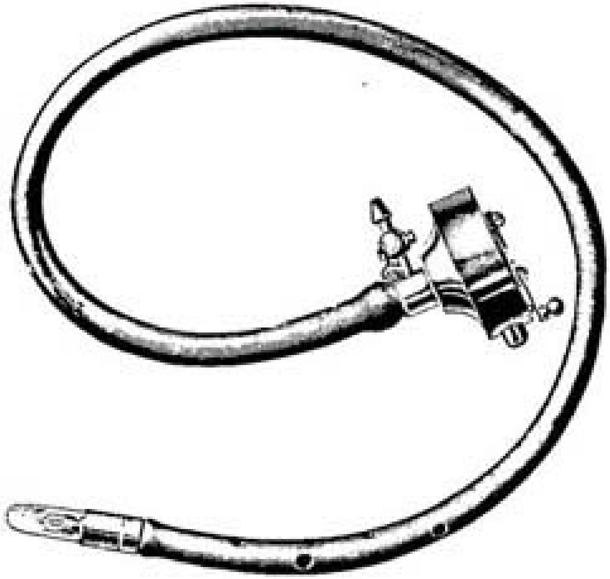


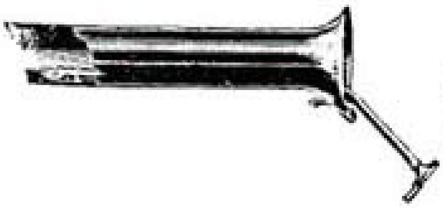
Lamp for trans-illumination of larynx, temple and jaw, by Dr. Vohsen, consisting of lamp in metal case, india rubber mantle and larynx diaphragm of metal. Including a spare lamp and in case.

Order No.
5760 ... ... **£1 17 6**

Lamp for trans-illumination of stomach by Prof. Einhorn, consisting of incandescent lamp carried at the end of a flexible india rubber tube. At the other end is a tap for filling the stomach with water and the mount is also fitted with a switch.

Order No.
5770 ... ... **£2 10 0**



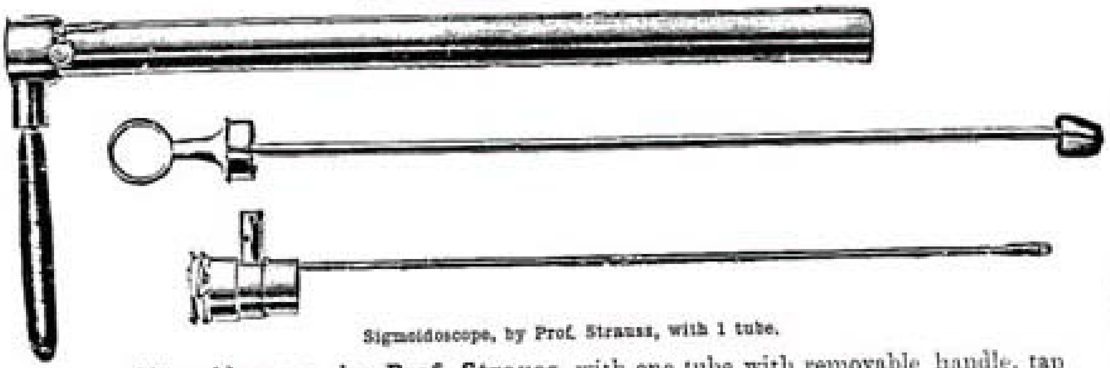


Vaginal Lamp made to clip on to a vaginal speculum. The light is brought right to the front and the stem of the lamp is thin so as not to interfere with the observation in any way. Including one spare lamp and in case.

Order No.		
5780	With one ebonite speculum	**£1 10 0**
5782	With three ebonite specula of different sizes	**2 0 0**
5784	Vaginal lamp only, as above, but without specula, including one spare lamp and in case	**1 5 0**
5786	Spare incandescent lamps for above ... ... each	**0 2 6**

Vaginoscope in conjunction with Casper's Universal Electroscope, page 75.

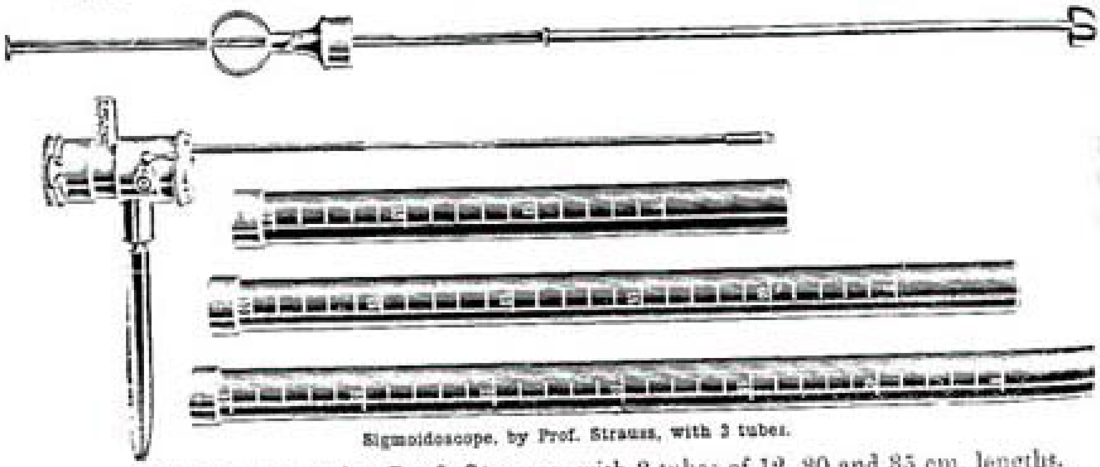
Surgical Lamps.



Sigmoidoscope, by Prof. Strauss, with 1 tube.

Sigmoidoscope, by Prof. Strauss, with one tube with removable handle, tap for inflation and sound. Incandescent lamp on long thin stem to allow of the light being taken to end of tube and therefore as near as possible to the object. The end of the fitting carrying the stem and lamp is closed by a removable window of glass. Including one spare incandescent lamp.

Order No.		£	s.	d.
5800	With 1 tube, 12 cm. long	£1	16	0
5802	With 1 tube, 30 cm. long	2	0	0
5804	With 1 tube, 35 cm. long	2	3	0



Sigmoidoscope, by Prof. Strauss, with 3 tubes.

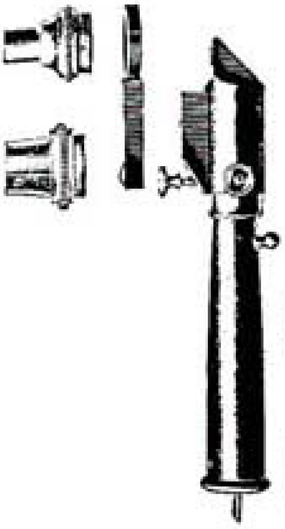
Sigmoidoscope, by Prof. Strauss, with 3 tubes of 12, 30 and 35 cm. lengths. With one mandrine adjustable in length. The stem carrying the incandescent lamp telescopes to provide adjustment in length. The fitting carrying the stem and lamp is provided with a removable handle, tap for inflation, and is closed by a removable glass window.

Order No.		£	s.	d.
5820	Including one spare incandescent lamp	£3	5	0

5830	Spare incandescent lamps for above Sigmoidoscopes ... each	0	2	6
5832	Double bellows, best quality, for inflation	0	6	0
5834	Wadding carrier, screwing on to the removable handle of the Sigmoidoscope. End made to screw off	0	11	6
5836	Brush, made to screw on end of stem of wadding carrier	0	1	0
5838	Caustic carrier of silver	0	6	0
5840	Powder blower	0	10	0
5842	Cautery burner for rectum	0	9	0
5844	Simple cautery handle for above	0	12	6
5846	Cautery cable, silk covered, heavily insulated	0	5	6
5850	Case for Sigmoidoscope, No. 5800	0	9	0
5852	Case for Sigmoidoscope, Nos. 5802 or 5804	0	11	6
5854	Case for Sigmoidoscope, No. 5820	0	14	0

Surgical Lamps

Universal Electroscope, by Prof. Caspar.



This lamp is designed for universal use; it will carry the various tubes required in examinations of urethra, rectum, vagina, mouth, ear, nose, &c., and is therefore a lamp of very exceptional utility.

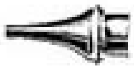
The general design of the lamp will be gathered from the illustration. Inside is placed the usual incandescent lamp, over which slides a metal tube with lens similar to that shown on page 65. This projects the light rays on to the prism carried in the top cover of the lamp, from whence the rays are thrown forward down the different tubes.

This top cover of the lamp also carries a metal ring-fitting into which screw two ebonite adaptors, a smaller one for carrying urethral, ear and nose tubes and one of greater diameter for the rectal and vaginal tubes.

The lamp provides an excellent light, so that a clear picture is obtained even with the longest tubes. The lens tube and the prism are movable independently so that they may be arranged in the best position in relation to one another and in relation to the source of light. The handle is fitted with a switch.

By removing the prism cover the internal lens is exposed, and in this condition can be efficiently used as an ordinary hand lamp.

Order No.				
5880	Universal Electroscope, as described, with one spare incandescent lamp and in plush lined case	£2	8	0
	Ebonite adaptor to screw on to the ring fitting of the lamp.			
5882	Small diameter, to carry urethral, nose and ear tubes	0	4	0
5884	Large diameter, to carry rectal and vaginal tubes	0	4	0
5890	Spare metal filament lamps ... ... each	0	3	6

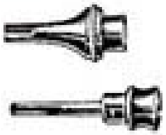


Ebonite Ear Specula to fit on Adaptor No. 5882.

Order No.		s.	d.
5900	Small diameter	1	4
5902	Medium "	1	4
5904	Large "	1	4

Complete Electroscope for Ear, consisting of Lamp No. 5880, Adaptor No. 5882, and three Ear Tubes, Nos. 5900 to 5904. Including spare metal filament lamp and in plush lined case.

Order No.		
5910	£2 16 0	



Ebonite Nose Specula to fit on Adaptor No. 5882.

With side aperture and with sound.

Order No.		s.	d.
5920	Small diameter	2	8
5922	Medium "	2	8
5924	Large "	2	8

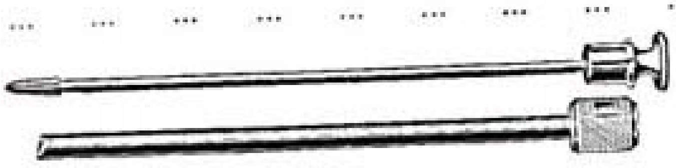
Complete Electroscope for Nose consisting of Lamp No. 5880, Adaptor No. 5882, and three Nose Tubes, Nos. 5920 to 5924. Including spare metal filament lamp and in plush lined case.

Order No.	
5930	£3 0 0

Surgical Lamps.

Electroscope for Ear and Nose, consisting of Lamp, No. 5880, Adaptor, No. 5882, three Ear Tubes, Nos. 5900 to 5904, and three Nose Tubes, Nos. 5920 to 5924. Including spare metal filament lamp, and in plush lined case.

Order No.		
5940	.. ..	£3 4 0



No. 5960.

No. 5970.

5950	**Urethroscope by Prof. Caspar**, consisting of Lamp, No. 5880, Adaptor, No. 5882, and three Urethral Tubes, Nos. 5960, a, e, and l. Including spare metal filament lamp, and in plush lined case	3 5 6
5954	**Urethroscope by Prof. Caspar**, consisting of Lamp, No. 5880, Adaptor, No. 5882, and five Urethral Tubes, Nos. 5960, a, e, i, p. and v. Wadding Carrier, No. 5980, Wadding Carrier, No. 5984. Including spare metal filament lamp, and in plush lined case	4 4 6

Urethral Tubes with Mandrine.

		a.	b.	c.	d.	e.	f.	g.	h.	i.	k.	l.
5960	Diam. Charrière ...	16	17	18	19	20	21	22	23	24	25	26

Nickel-plated and highly finished, **4/6** each.

		m.	n.	o.	p.	q.	r.	s.	t.	u.	v.
5960	Diam. Charrière ...	27	28	29	30	31	32	33	34	35	36

Nos. 5960 m. to p., **5/6** each. Nos. 5960 q. to v., **6/6** each.

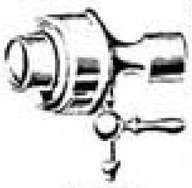
The tubes a. to l. are more especially for the male urethra, and the tubes m. to v. for the female urethra.

Urethral Tubes, with Knee Obturator.

By Dr. Lohnstein, for posterior end of urethra.

		e.	g.	i.	l.
5970	Diam. Charrière	20	22	24	26

Nickel-plated and highly finished, **16/-** each.

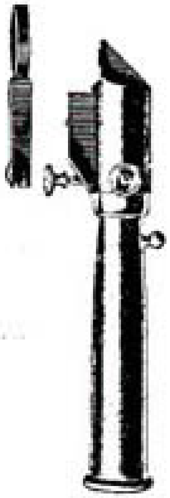


No. 5988.

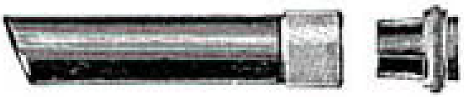
Order No.		s. d.
5980	Wadding Carrier. Simple stem with handle, and with roughed end for twisting the wadding round	2 0
5984	Wadding Carrier, with end shaped as pliers, and with sliding ring for closing same on the wadding	5 0
5988	Fitting for closing the Urethral Tubes for inflation.	25 0
	With glass window and tap	6 0
5992	Double Bellows, best quality	

Prices and particulars of foreign body pliers, needles, knives, cautery burners, &c., for use with above, furnished on request.

Surgical Lamps.



Order No.				
6000	**Rectoscope, by Prof. Schreiber,** consisting of Lamp No. 5880, Adaptor No. 5881, 3 Rectal Tubes Nos. 6008 to 6012, and 1 Wadding Holder No. 6020. Including spare metal filament lamp and in plush lined case ...	£6	0	0
6004	**Rectoscope, by Prof. Schreiber,** consisting of Lamp No. 5880, Adaptor No. 5884, 3 Rectal Tubes Nos. 6008 to 6012, 2 Wadding Holders Nos. 6018 and 6020, 1 Foreign Body Pliers No. 6026, Handle for same No. 6030, and Spoon No. 6036. Including spare metal filament lamp and in plush lined case ...	8	2	6
	Rectal Tubes, by Prof. Schreiber, with cm. scale and sound.			
6008	15 cm. long...	£0	17	6
6010	25 ,,	1	0	0
6012	35 ,,	1	2	6
	Wadding holder to clean the intestines.			
6016	15 cm. long...	0	5	0
6018	25 ,,	0	5	0
6020	35 ,,	0	5	0
	Foreign body pliers.			
6024	25 cm. long...	0	11	6
6026	35 ,,	0	12	6
6030	**Handle** for pliers, Nos. 6024–6	0	17	6
	Blunt Spoon.			
6034	With rod 25 cm.	0	5	0
6036	,, 35 ,,	0	5	6



6050	**Vaginoscope,** consisting of Lamp No. 5880, Adaptor No. 5884, and 1 Vaginal Tube No. 6054. Including spare metal filament lamp and in plush lined case ...	£3	4	0
6054	**Vaginal Tube,** 15 cm. long, 20 mm. diameter ...	0	12	0

For Vaginal Lamp arranged to clip on to an ordinary speculum. See page 71.

Connecting Cables.

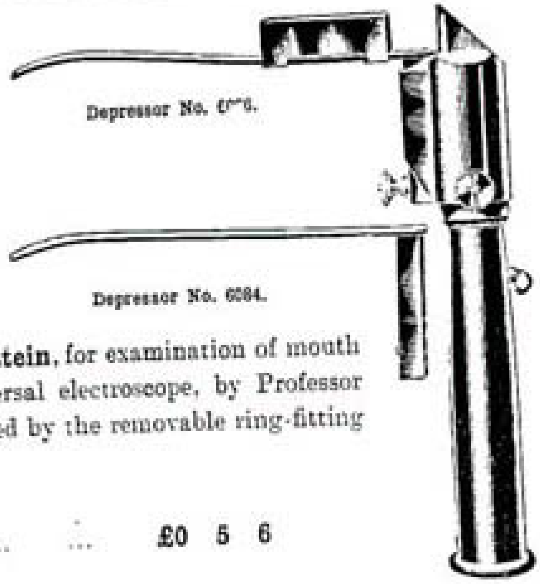
The same cable can be used for almost all the Lamps.

Best quality, rubber insulated and silk covered. With ebonite and plated metal terminals.

Order No.		s.	d.	Order No.		s.	d.
6060	1½ metres long ...	5	6	6064	2½ metres long ...	6	6
6062	2 ,,	6	0	6066	3 ,,	7	0

Cables are not included with lamps except where specifically stated.

Surgical Lamps.



Electroscope for examination of larynx and cavities of mouth.

Consisting of Lamp No. 5880, and plain tongue depressor, No. 6084, by Dr. Kirstein.

Order No.
6080 ... ... £2 13 6

Tongue Depressor, by Dr. Kirstein, for examination of mouth and larynx. Made to fit the Universal electroscope, by Professor Caspar, in the position usually occupied by the removable ring-fitting which carries the adaptors and tubes

Order No.
6084. Plain £0 5 6

6086. With diaphragm £0 8 6

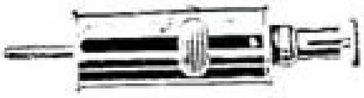
Tongue Depressor, by Dr. Kirstein, Plain, with Handle, for examination of mouth and larynx. For use with any ordinary laryngeal lamp.

Order No.
6088 ... ... £0 6 6

The surgical lamps listed in the preceding pages are all made to work with from 2-10 volts, from the Universal apparatus (page 108), the cautery and light transformers (pages 46 and 47), the switchboards for light (page 48), the accumulator batteries (page 49), or from dry or wet batteries, &c.

In order to regulate the voltage of the current from these apparatus from 0 upwards to suit the particular lamp in use, they are all provided with a rheostat, or regulating resistance. This permits accurate regulation of the current for all lamps.

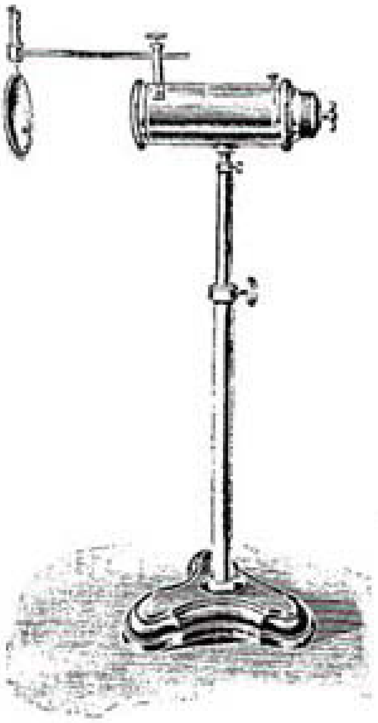
The little rheostat listed below is intended as a supplementary regulation to work in conjunction with existing rheostats, for providing an exceedingly fine graduation in exceptional cases, but is not necessary at all in the ordinary way. In many cases, however, surgical lamps are operated by accumulators or dry cells. One lamp declared as 4 volt may burn comparatively dim with 3 dry cells or 2 accumulator cells, whereas another also declared as 4 volt may burn too brightly. This overstraining soon blackens the lamp and greatly reduces its lifetime. In such cases the little rheostat is invaluable.



Order No.
6100. Rheostat as described, nickel-plated, with sliding contact ... £0 7 6

Surgical Lamps.

Working direct from the Mains.



Illuminating Lamp, by Prof. Fränkel, especially for larynx, ear, nose, &c. The Nernst lamp has been replaced in the latest models by an incandescent lamp of high candle power. With lenses and reflector, adjustable. Mirror, with sliding rod and with ball joint. With switch.

The whole finely plated and finished, and mounted on telescopic enamelled iron floor stand.

Order No.		
6200	... ...	£4 5 0
6204	Same, but mounted on short table stand	3 15 0

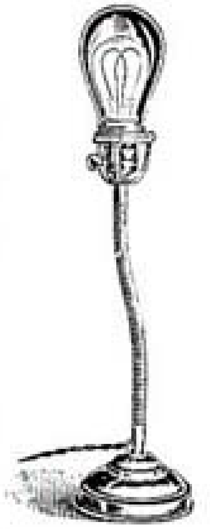


Table Lamp, with plated reflector, and plated flexible stem, enabling the lamp to be bent to any position. Mounted on heavy plated iron foot. With switch and with flexible connecting cable with plug. Very convenient for the operating table.

Order No.		
6220	... ...	£1 5 0
6224	Same, on floor stand	2 5 0

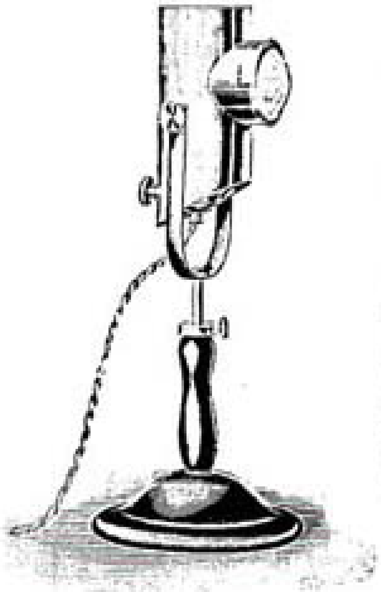


Table lamp, by Dr. MacDonald, with removable bull's eye lens. A very popular lamp for throat, nose ear, eye, &c.

Fitted with special 32 c.p. zig-zag carbon filament lamp, otherwise known as focus lamps, the filament being kept in the centre of the bulb.

The focus lamp can be raised and lowered behind the lens, or can be removed entirely. The lamp tilts backwards and forwards, rotates horizontally and telescopes into its heavy iron foot. Complete with flexible connecting cable and plug.

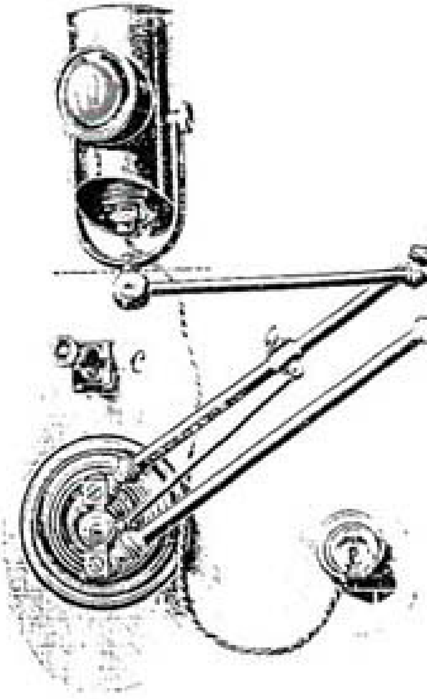
Order No.		
6240	... ...	£2 5 0
6244	Same, on floor stand	3 10 0

Iris Diaphragm for MacDonald lamp, next page.

State voltage of main when ordering any of above lamps.

Surgical Lamps.

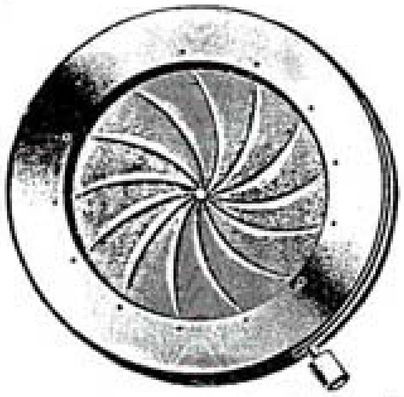
Working direct from the main.



Dr. MacDonald's Lamp on Bracket. Exactly as described on previous page, provided with special focus lamp and adjustable to any position. Bracket also adjustable as required. The lamp can be removed from the bracket for use as a hand lamp.

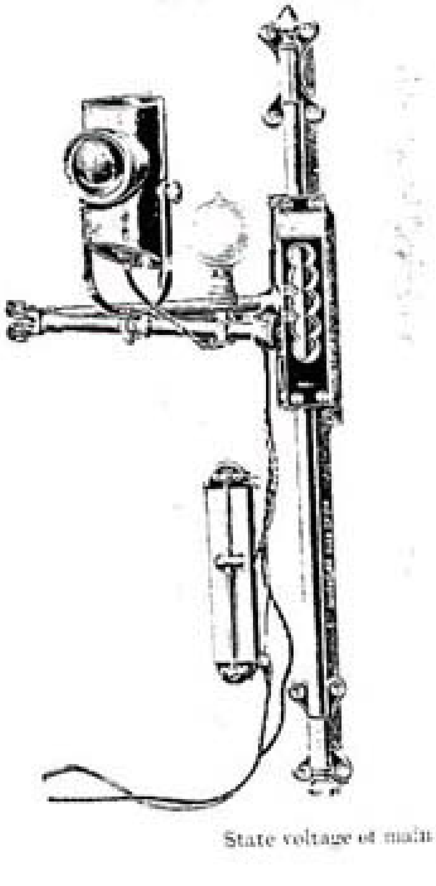
The whole of best make and finish. Complete with 32 c.p. focus lamp.

Order No.		
6260	... ...	£4 6 0
6264	Same lamp, but without bracket. A clamp (c) is provided with it, so that it can be attached to an ordinary gas bracket, &c.	1 15 0



Iris Diaphragm, with frosted glass plate, to fit the MacDonald lamps after removal of the bull's-eye. The intensity of the light can be gradually regulated without varying the colour of the light, a matter of importance for ophthalmic purposes. The frosted glass plate obviates all reflection of the lamp filament.

Order No.		
6270	... ...	£1 0 0



Order No.

6280 **Ophthalmic Bracket Lamp**, with jointed arm, and arranged for raising and lowering upon the vertical rod, remaining at any desired height.

With switch and with 32 c.p. zig-zag carbon filament focus lamp, frosted.

Universally in use £4 0 0

The MacDonald lamp No. 6264, can be fitted to this bracket if desired, as shown in illustration.

State voltage of main when ordering any of above lamps.

Electric Light Baths.

Electric Light Baths are in universal use at the present day. Although it is only a very few years since they were first designed they have proved themselves so successful in a great variety of cases that they are now universally installed in the large hospitals, hydropathics and similar institutions throughout the whole world, and a great number of doctors even use them in their own consulting rooms.

The construction of the various baths is comparatively simple. They take the form of cabinets for treating in the sitting position, or the form of couches for reclining position, while there are also a number of small appliances for treatment of the limbs, the trunk, shoulder and all local parts. Although, as already remarked, their general design is actually very simple, nevertheless much experience is necessary in order that they shall be constructed on hygienic lines and of suitable dimensions. In the case of some cheap baths the makers endeavour to effect the reduction in cost by reducing the size of the bath very considerably and then fitting the same with a less number of lamps. This is not a practical arrangement, because a certain distance must always be allowed between the patient's body and the electric lamps, as otherwise the shape of the lamp is such as to tend to throw a focus point at two or three inches distance, so that if the patient's body is too near to any lamp there is great risk of burning at that point.

Again, the increased size of a bath permits of much better diffusion of the light and heat from the lamps. Our own full body baths are fitted with about 48 16-c.p. electric lamps, and the size of the different baths is so arranged that there is no risk of burning nor any risk of the patient touching the lamps by a little movement when in the bath.

The heat is rapidly generated, and profuse perspiration is set up in a very few minutes, the total bath usually occupying some 15 or 20 minutes. If for any special reason a greater temperature be desired the 16-c.p. lamps can be replaced by lamps of higher candle-power, say 25-c.p., which simple alteration enables a much greater temperature to be attained.

Advantages of Light Baths.

With a Light Bath, however, it is not necessary to generate a high temperature. The stimulating action of the light rays striking upon the body creates of itself a profuse perspiration, so that it is possible to set up a perspiration to any desired extent at a comparatively very low temperature. This constitutes one of the great advantages of the Light Bath, and it is for this reason that patients suffering from head and heart troubles may safely be treated with a Light Bath when any other form of Turkish, Russian or hot air bath would be altogether out of the question.

It is found that a temperature of about 120° to 140° F. is ample to produce the most profuse perspiration. In many cases even 100° is ample, and 180° is the maximum under ordinary conditions.

The patient's head being always outside the Light Bath itself it follows that the head is not affected and, moreover, that the lungs inhale pure air. This is very different to the old Turkish baths, where one was compelled to sit in a very high temperature and to inhale the exudations of other bathers' bodies.

The temperature of a Light Bath can be exactly regulated to suit each individual patient. This of course is obviously an essential condition in any scientific medical treatment, but is a condition that is not complied with in the case of Turkish and similar baths.

It has been stated above that the light rays set up a profuse perspiration themselves, quite over and above the action of heat. It must not, however, be lost sight of that the light rays exert a far more beneficial action in other respects. The wonderful curative action of the light rays, that is to say the blue, violet and ultra-violet rays (the so-called chemical or actinic rays) has been fully demonstrated to the world by the late Prof. Finsen by his remarkable cures in cases of lupus and all skin diseases. This treatment consists essentially in administering the actinic rays of light without any heat whatsoever. The elimination of the heat rays is an essential condition, and special cooling devices have to be adopted in constructing a Finsen apparatus. The Finsen light treatment of lupus and all skin diseases is now universally known and adopted throughout the whole world, and the wonderful curative action of light is now fully recognised.

In the case of a Light Bath the rays impinge upon the body of the bather and penetrate to a certain depth into the tissues, thereby stimulating metabolism and generating heat in the deeper structures. In many cases, such for instance as consumption, anæmia, neurasthenia, etc., it is not desired to subject the patient to severe sudatory effects, but it is precisely these cases which derive the most benefit from light. A Light Bath is therefore eminently suitable, and the bath can be just kept to a comfortable degree of warmth without in any way forcing a perspiration. In this same connection it should be noted that whereas many patients have a distinct feeling of weakness and lassitude following a Turkish or Russian Bath, in the case of a Light Bath they feel braced up and energized.

Another important advantage of the Light Bath is that the patient bathes in a dry heat. In a Turkish or Russian Bath the pores of the skin become so saturated with moisture that they are choked up and thus there is interference with further profuse perspiration.

It will be understood from the foregoing that Electric Light Baths are, in general, far superior to any of the older systems, as the following summary of their advantages will show:—

1. Stimulative action of light as well as heat.
2. Head and lungs not affected, the lungs inhaling always pure air.
3. Perfect regulation of the light and heat to suit each individual bather.
4. Profuse perspiration at a comparatively low temperature.
5. Absolutely dry radiant heat and therefore profuse perspiration and efficient working of the pores.
6. Hygienic, private, efficient, simple and convenient.
7. Low initial cost and low maintenance.

Dealing with this latter point it might be mentioned that a 50-light bath consumes 2,500 watts per hour, that is to say 2½ units of electricity per hour. A treatment occupying about a quarter of an hour, it follows that the consumption of current is about ½ a unit, a unit of electricity at lighting rates being about 5d., and at power rates 2d. or a 1d. Electric Light Baths in common with all other electro-medical apparatus can of course be worked off power rates of electricity. Even this trivial consumption of current only goes on just while the bath is actually in use, whereas in many systems of baths the furnaces or other heat generators require to be kept constantly going.

Arc Light Baths.

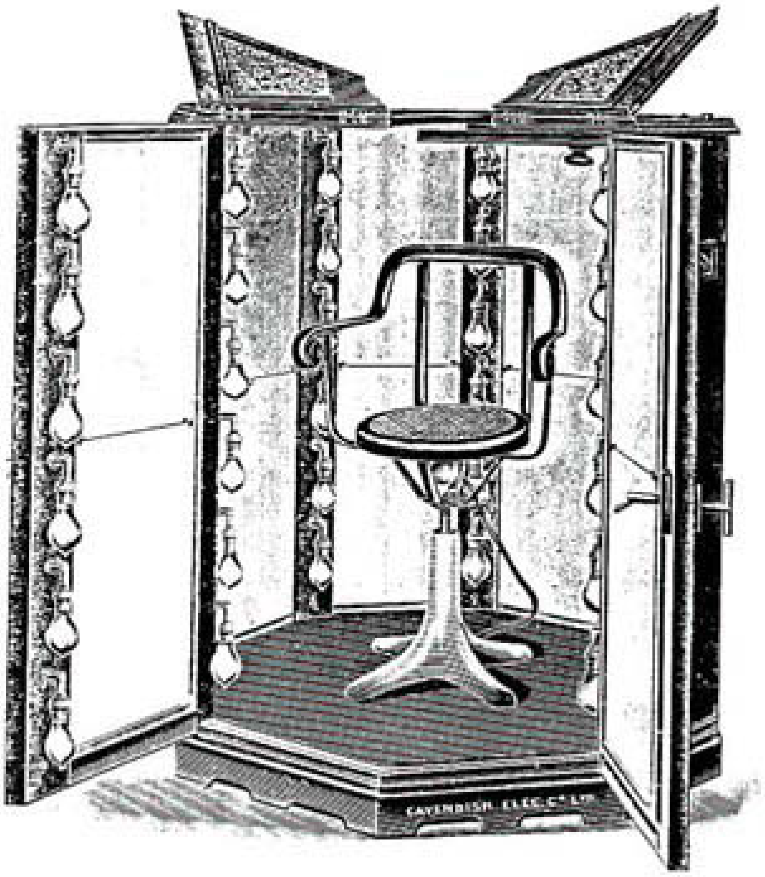
In addition to the 48 electric incandescent lamps fitted to our baths it is occasionally requested that 4 electric arc lamps be added. The Arc light is very much richer in the actinic rays of light than the incandescent lamps, and is therefore of the greatest benefit in cases of consumption, asthma, anæmia, neurasthenia, etc., cases which one would naturally expect to derive the greatest benefit from light, in contradistinction to rheumatism, gout, arthritis, lumbago, and other similar cases where one would naturally expect the greatest benefit from heat. In either set of cases, however, there is advantage in administering light and heat simultaneously, but in the one case reducing the heat and increasing the light and in the second case increasing the heat and treating light as of secondary importance. A popular method with baths provided with arc lights is to first of all switch on the incandescent lamps to create the desired temperature, and then when a mild perspiration is set up to switch off the incandescent lamps and switch on the four arc lamps, leaving the patient to finish the treatment bathing in arc light, the temperature of the bath meanwhile remaining about steady since the arc lamps provide also a fair amount of warmth.

Our principals have had great experience in fitting up every description of Light and Heat baths—in large hospitals, hydropathics and similar institutions. The essential conditions are fully understood, and each bath is constructed with due regard to such conditions, that is to say on the score of size, number of lamps, hygienic conditions and general arrangement.

Electric Light and Radiant Heat Baths, with white, red or blue incandescent lamps, with arc lamps, or with combinations, can be manufactured to any size or pattern to comply with special conditions. Also Hot Air Baths, Steam Baths, Medicated Steam Baths, and every description of such apparatus.

Light Baths.

Standard Pattern Cabinet Bath, with 48 Incandescent Lamps.


CAVENDISH ELEC. Co. LTD.

Electric Light Baths are manufactured in a great variety of patterns, but 10 years' experience has taught us which are the most efficient types in regard to dimensions, shape, materials, and general arrangement.

The standard pattern Cabinet Bath, as illustrated, is octagonal in shape, permitting the lamps being set back so that the patient does not approach too near to them with risk of burning at certain points as occurs with other baths of wrong shape and size. At the same time the internal air space is reduced as much as possible, so that our baths heat up rapidly, saving time, current and inconvenience to patient.

They are lined inside with white opal, constituting the best reflecting surface while permitting of perfect sterilisation. Floor of bath covered cork lino for easy cleaning. Bath fitted with four switches, controlling 12 lamps each, four china fuses and plug for main connection, mounted on switchboard on side of bath.

Light Baths.

Standard Pattern Cabinet Bath with 48 Incandescent Lamps.

As illustrated and described on previous page. State voltage for lamps when ordering.

Prices.

Order No.

6500 In selected pinewood, stained and polished dark to represent mahogany. Top of solid polished mahogany, with windows of thick ornamental glass. Wood flap beneath top to close round patient's neck.

Including light bath chair with heavy white enamelled iron foot, with cane seat, with arms and back rests covered leather. With incandescent lamp fitted beneath seat, and cable and plug for connecting same. Chair adjustable in height... £36 0 0

(State if Bath preferred stained and polished in any other colour.)

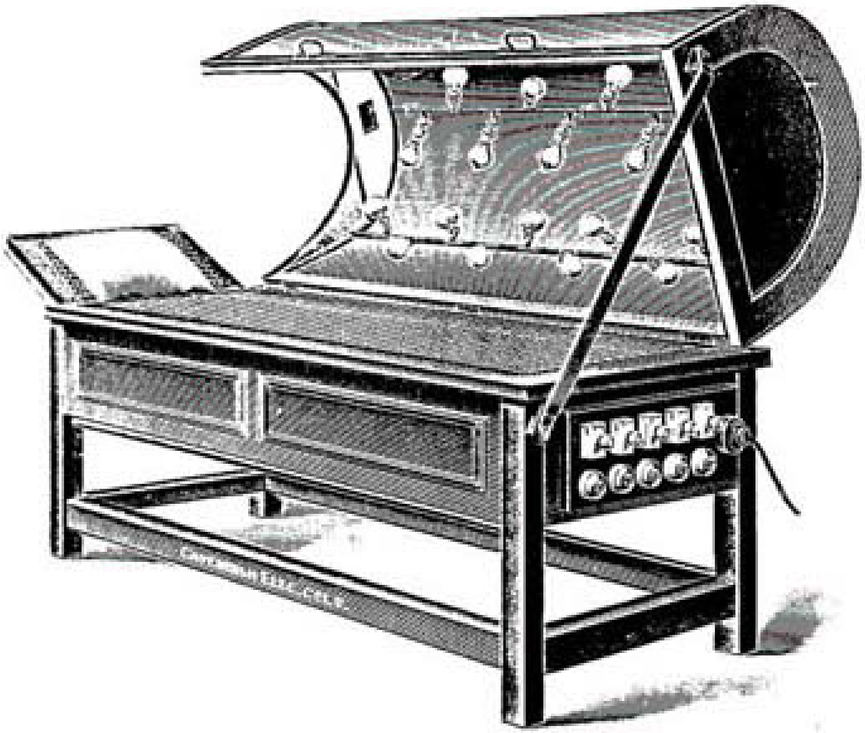
6510 In solid oakwood, light yellow polished or dark fumed finish Top of solid polished mahogany, otherwise as described, including chair and switchboard £42 0 0

(State which colour is preferred when ordering.)

Top of bath can be removed and the bath itself divided in halves, thus permitting of easy handling and allowing it to be taken through any ordinary doorway.

Light Baths.

Standard Pattern Reclining Bath with 50 Incandescent Lamps.



We have made many types of Reclining Light and Radiant Heat Baths, with incandescent lamps, arc lamps, radiator lamps, &c., in pattern as illustrated and in oblong box pattern with "Semi-Reclining" couch or chair. We shall be pleased to manufacture any pattern of bath that anyone may want, in any material and fitted with any kind of lamp or lamps, but our experience has taught us that nothing can be more efficient or more practical than the model we adopt as our standard.

It is very strongly constructed and the woodwork is kept plain in order to avoid unnecessary crevices for dust to lodge in, while also being more in keeping with its purpose. The top is lined with aluminium, constituting the best reflecting surface, while another sheet of aluminium forms the outer covering and gives the bath a workmanlike appearance and finish. So well does the aluminium reflect the light and heat from the lamps that even the inside lining hardly gets warm and, there being a space of an inch between the lining and outer covering it follows that the outer covering cannot possibly become hot.

With other baths where a lining of washable cloth, asbestos, &c., is adopted, with an outer covering of similar material the heat bakes right through, proving in the first place that the reflection is poor and the light and heat much absorbed, and resulting in the second place in the rapid perishing of the materials.

The top of the bath is fitted with 80 lamps, and the lower part with 20. These latter are arranged equi-distant round the cane matting bed, with a lining or bottom of aluminium to reflect the light and heat upwards, and serving also to catch the perspiration, &c.

The top of the bath is hinged so that the patient can be placed on the bed without trouble or inconvenience. The cane bed is hinged also so that the underneath lamps are accessible and to permit of the bottom of the bath being easily wiped out and kept clean.

The head rest can be raised or lowered, with a fly nut for fixing in the position desired. The end of the bath where it rests over the patient's neck is fitted with a cloth to close it in, while yet allowing freedom of movement, &c.

A switchboard, with necessary switches and fuses controlling the lamps in sections, is fitted to the foot of the bath, together with a plug socket ready for connecting to the main.

The whole of sound construction to stand any amount of use. All wiring is hidden and away from heat or moisture. The surfaces are plain for ease in wiping over. Of best finish and absolutely efficient and convenient.

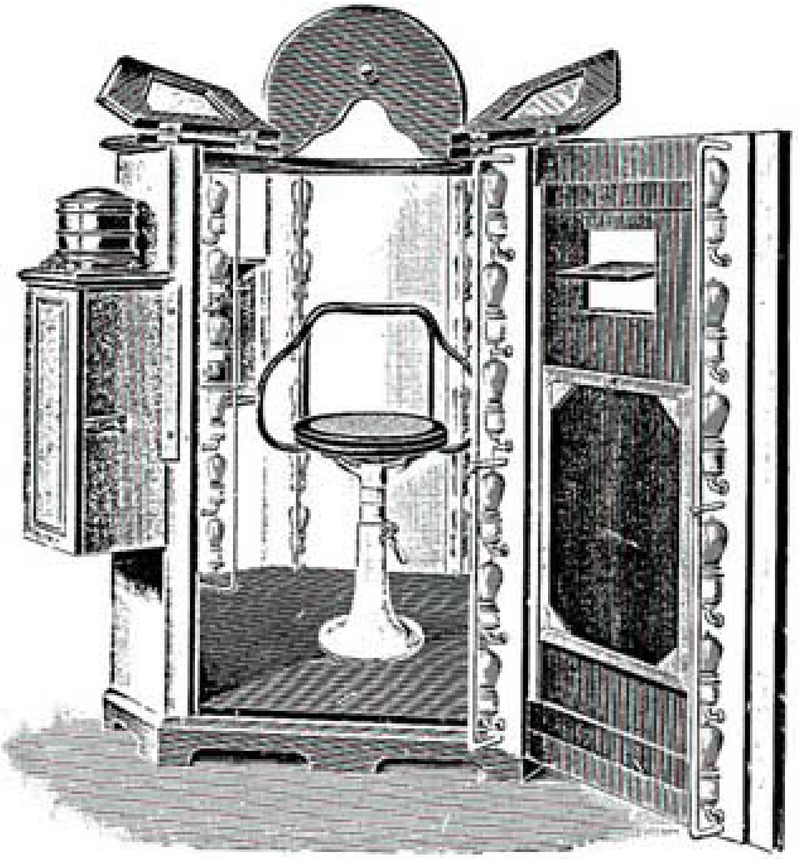
Order No.					
6530	In polished pinewood complete with 50 incandescent lamps ...	£40	0	0
6540	In solid oakwood, polished, with 50 incandescent lamps ...	45	0	0

(State if Oakwood is preferred polished light or dark fumed finish.)

If the underneath lamps are switched on, the same bed then constitutes a very convenient heated massage couch, especially convenient, because massage treatment often follows a light bath, and advantageously so.

Combined Double Light Bath.

With 48 Incandescent Lamps and 4 Arc Lamps.



This Bath is octagonal in shape but with four large sides and four small sides, the latter carrying the four arc lamps. It is lined inside with white opal glass, constituting the best reflecting surface and allowing of perfect sterilisation. Floor covered lino for easy cleaning.

The incandescent lamps provide light and heat, but principally the latter for sudatory effects, while the arc lamps provide chiefly light, rich in the actinic or chemical rays. See reading matter page 81.

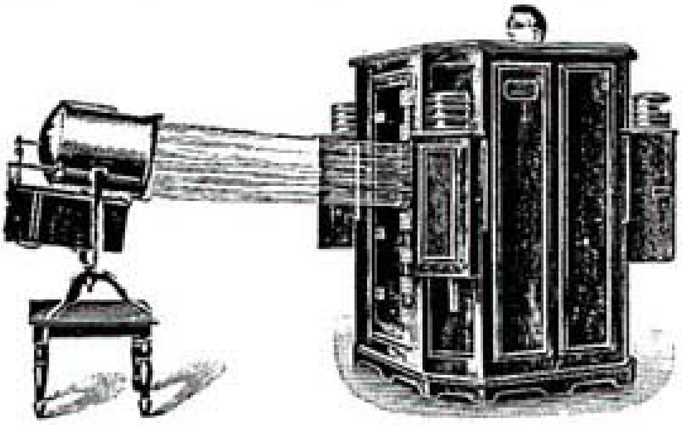
The great feature of this bath is the system whereby a **simultaneous local treatment** to the actual seat of the complaint can be administered at the same time as general full-body treatment. To permit of this, the door of the bath is fitted with a number of flaps or smaller doors, behind which is arranged a screen of special blue glass in order to close the bath in when one or more of the flaps are opened.

The simultaneous local treatment is carried out by means of an arc light projector arranged in front of the bath, which concentrates a most intense light and heat on to the area desired. See page 91 for full description of projector.

The revolving chair supplied with the bath enables the patient to turn himself about so that the rays from the projector can reach any part of his body. To facilitate this the top of the bath is made to revolve on rollers, and webbing straps are fitted beneath the top of the bath for the patient to hold when turning himself.

The opening in the door of the bath enables the patient to put his hand out, that the doctor may take the pulse, &c., if desired.

Combined Double Light Bath.



The illustration shows clearly the system of carrying out the simultaneous local treatment by means of the arc light projector.

Prices :

For either continuous or alternating current main. State which when ordering and the voltage. If alternating current state number of periods as well as voltage.

Bath as described, with 48 incandescent lamps and 4 arc lamps. The latter of very best design, specially constructed for the work, and made to burn very evenly and steadily. Each enclosed in polished wood case lined asbestos, and made for raising and lowering. Behind the arc itself is a white enamelled iron reflector to reflect the rays into the bath. They are automatic feed lamps and on 200 volt main or over they burn in one circuit with a total consumption of 10 amperes. On 100 volts or thereabouts they burn 2 in series (2 circuits) with total consumption of 20 amperes.

Including 4 blue crystal glass shades for the arcs, and one large shade to door of bath.

Including special revolving chair, heavy white enamelled iron foot, cane seat, arm and back rests covered leather ; with lamp beneath seat and cable and plug for connecting same. Chair also adjustable in height with a rack and spring catch, that it may be raised or lowered without revolving.

Including the necessary resistance for the arcs. With thermometer and connecting terminals at back of bath on slate bases with insulating covers.

The whole of best design, construction and finish.

Order No.				
6560	In light polished oak, with mahogany top and flaps ...	£70	0	0
6570	In selected pinewood, with mahogany top and flaps ...	62	0	0

In all baths of this type, Nos. 6560/70, 6590/6600, &c., the top is removable and the arc lamps and their cases. The bath itself divides into halves, and thus passes easily through any ordinary doorway.

Combined Double Light Bath.

Estimate for complete Installation up to 120 volts.

		£	s.	d.
Combined double light bath	Order No. 6560	£70	0	0
Arc light projector with table, &c.	,, 6750	20	0	0
Necessary resistance for projector	,, 6770	1	10	0
White marble controlling switchboard	,, 6680	11	0	0
Order No. 6580. Complete outfit		102	10	0

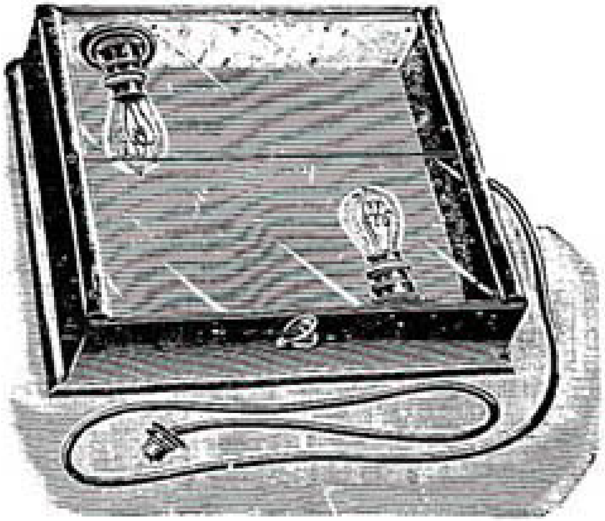
If main up to 250 volts the resistance (O.N. 6774) increases **£2**, and switchboard (O.N. 6684) **£1**.

Order No. 6590. Complete outfit	£105	10	0

Double Light Bath.

Same baths, exactly as described, but without the special flaps and glass shade to door for simultaneous local treatment. Without the special revolving lid to top of bath and with chair as illustrated and described on pages 83 and 84 instead of the special chair.

Order No.				
6590	In light polished oak, with mahogany top	£62	10	0
6600	In selected pinewood, with mahogany top	54	10	0



Light Bath Chair.

As illustrated on page 83. With heavy white enamelled iron foot. Cane seat with lamp fitted beneath and with cable and plug for connecting same With iron arm and back rests, covered leather. May be raised and lowered by revolving. Well made and finished.

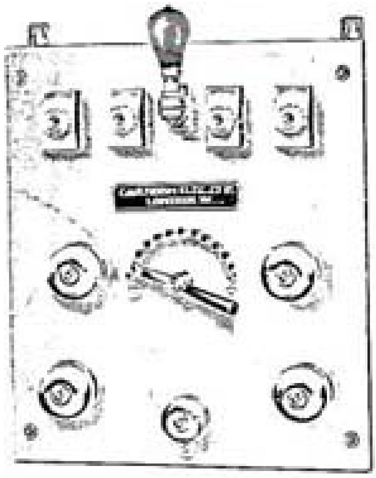
Order No.				
6620	...	£2	10	0

Light Bath Footstool, invariably taken. Polished wood case with thick glass top in two pieces. With incandescent lamps and length of flexible cable with lamp-adaptor to connect to one of the lamp-holders in the bath.

Order No.				
6640	With 2 lamps	£1	10	0
6641	,, 4 ,, ...	1	15	0

Switchboards and Regulating Rheostats.

FOR LIGHT BATHS.



Switchboard for combined double light bath (page 88) and double light bath (page 89), consisting of: white marble board with four switches for the incandescent lamps (controlling 12 lamps each), and switch for the arc lamps. With crank rheostat and studs to regulate the light and heat of the 48 incandescent lamps as a whole. This dimming of all the lamps provides perfect control of the light and heat, and obviates the necessity of switching off rows of lamps whereby the light and heat is unevenly distributed over the body. The resistance coils are suspended behind the board in iron frame on porcelain insulators. Best make and finish and all fitments of the best. With best type china fuses for each circuit.

Order No.		
6670	Up to 120 volts ...	£9 10 0
6674	From 120–250 volts..	10 10 0

Switchboard for combined double light bath and projector. Exactly as above, but provided in addition with a large socket and switch for the projector.

Order No.		
6680	Up to 120 volts	£11 0 0
6684	From 120–250 volts	12 0 0

Switchboard for incandescent light bath (page 84) and reclining light bath (page 86). Of white marble with switches and fuses for the various circuits. With crank rheostat for regulating the light and heat. Resistance coils suspended at back, as described above.

Order No.		
6690	Up to 120 volts	£9 0 0
6694	From 120–250 volts	10 0 0

When these boards are purchased with a bath, the switches and fuses will not be fitted on the bath itself as usual, and the prices take this into consideration.

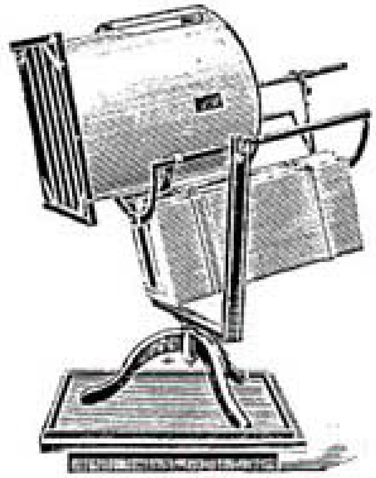
Regulating Rheostat.

Regulating **Rheostat** for controlling the light and heat of the 48 or 50 incandescent lamps as fitted to combined double light bath, double light bath, incandescent light bath and reclining light bath, consisting of white marble board with crank rheostat and studs: with resistance coils suspended at back, as described above. With two terminals for connecting main.

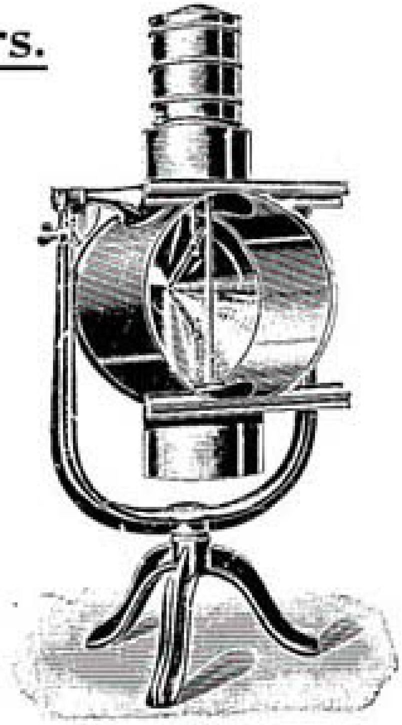
Order No.		
6700	Up to 120 volts	£2 15 0
6704	From 120–250 volts	3 5 0

Switchboards can be made up in any pattern, on enamelled slate or on marble, with carved wood frames, &c.: with spare plug sockets and switches for working other appliances, or even in combination with switchboards for other work.

Arc Light Projectors.



No. 6750.



No. 6754.

These Projectors are used in conjunction with the light bath, listed on page 88, for giving a simultaneous local treatment. They are also used for any local application of light and heat quite apart from the bath, and constitute a highly successful means of treating gouty and rheumatic affections, chest complaints, sciatica, lumbago, neuralgias, and all classes of complaints benefited by light and heat. See repeated articles in the journals and books. Also exceedingly good in the treatment of wounds.

The light from a carbon arc is essentially rich in the actinic (blue, violet and ultra-violet) rays, as is common knowledge; as witness the use of such in the Finsen light treatment of lupus, and all skin diseases, while in further proof it might be mentioned that we print all our X-ray negatives by its means during the winter, and very great is its action on the photographic paper.

The heat is secured by means of the movable parabolic reflector behind the arc, whereby the pencil of rays can be concentrated from a diameter of some 6 feet down to a diameter of some 6 inches. The heat increases gradually with the extent of concentration, and when highly concentrated it is altogether unbearable, so intense is it. With less concentration the heat can be regulated down gradually to a mere warmth. Quite apart from the degree of concentration the heat can be controlled according to the distance of projector from patient.

Specification. Automatic feed arcs, burning with from 15 to 30 amperes nominally and best at 15. Cylinder and fittings finely plated and iron stand enamelled. A vertical tilt is provided, with a fly nut for fixing, while the stand rotates on the foot.

The nickel plated parabolic reflector slides backwards and forwards, enabling concentration of the light and heat to any extent desired.

Order No.					
6750	For any voltage continuous current	**£20**	**0**	**0**
6754	For any voltage alternating current	**20**	**0**	**0**

The prices include a polished oak table on castors, with a drawer for shades. One red and one blue crystal glass shades or screens, and one asbestos screen with hole in centre. All in metal frames, and slides are provided on cylinder to receive them. Including also 5 pairs of best carbons.

Resistances and Transformers

For Projectors.

Every arc lamp must have a resistance or transformer in circuit so that these are quite essential. With continuous current main a resistance is necessary. With alternating main one may take either a resistance or transformer, the latter being far the better. On 100 volt main the transformer will consume about 7½ amperes when working the projector with 15 amperes, so there results a saving of 50%, which is a great consideration as fairly heavy currents are being dealt with. On 200 volt main the consumption is only about 4 amperes, the saving thus amounting to much more, actually about 800 watts being consumed from the main instead of 3,000 watts. Moreover, the transformers cause the projectors to burn more steadily off the alternating mains.

We supply a very simple and cheap type, and they will therefore be considered by all as well worth such little increased cost for such great advantages.

Resistance for Projector, for continuous current (or alternating current). Resistance wires on iron frame with perforated iron casing.

Order No.		
6770	Up to 120 volts	£1 10 0
6774	From 120–250 volts	3 10 0

Transformer for Projector, for alternating current only. Special type, simple and compact. On iron frame with perforated iron casing.

Order No.		
6780	Up to 120 volts	£3 10 0
6784	From 120–250 volts	4 10 0

Screens for Projectors. See page 91. With about 8 strips of special crystal glass (2 in. in width) to allow for expansion. In metal frame.

Order No.		s. d.	Order No.		s. d.
6790	Blue glass	8 0	6792	Red glass	8 0

6794 Similar shade of asbestos, with hole in centre. To limit area treated 7 0

Blue and red crystal glass strips, about 13 in. × 2 in. ... each 4d.

Best Quality Carbons, non-smoking.

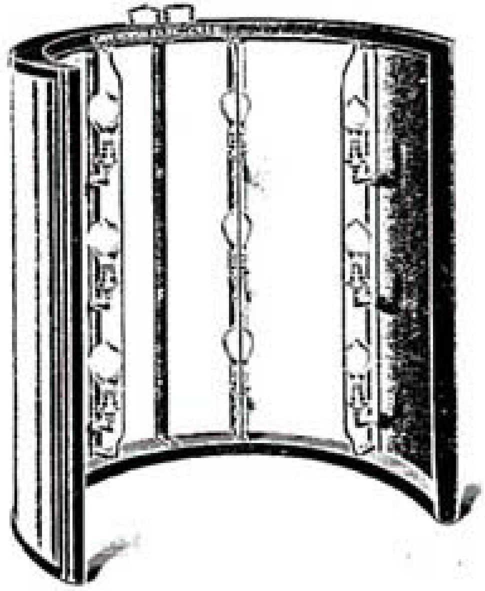
Order No.			
6800	For arc lamps of light baths, continuous current, and for continuous current projector	per 100 pairs	£1 5 0
6802	For arc lamps of light baths, alternating current, and for alternating current projector	per 100 pairs	1 5 0
6804	**Special** short carbons for **Finsen-Reyn lamp.**	per pair	0 0 3

Carbon Holders, for using up short carbons. For use in the continuous current projector for using up the carbons after they have become otherwise too short. Also for using up the short carbons from arc lamps of a light bath in the projector, thus saving much waste.

Order No.			s. d.
6810	Split metal tubes	per pair	4 6

Portable Light Baths.

These local Light and Heat Baths are made for treatment of the limbs and trunk, with 6 lamps and 12 lamps respectively, and are extremely useful and efficient for their purpose. They are made in aluminium and are therefore light in weight, while this metal constitutes an excellent reflecting surface, and moreover can be kept scrupulously clean, which is not possible with those baths lined inside with cloth and asbestos. The aluminium is fixed over a strong but light oak-wood frame.



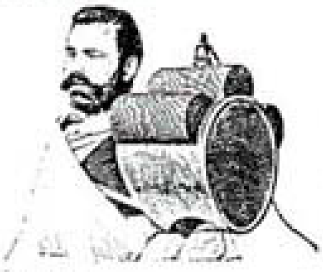
These baths are of the greatest possible service where a patient has to be treated at his own residence, or in bed, or for use in the different wards of a hospital, &c. Handles are provided for carrying. They are also particularly suitable for treating children.

These baths provide a greater temperature than is usually required with a full-body bath, running up to about 220°–250° F., as of course a greater heat can be borne locally than is the case with full-body treatment. If still greater heat be desired for special purposes the usual 16 c.p. lamps can be replaced by 25 c.p. lamps, when a much higher temperature will be attained.

Complete with length of flexible cable, with plug for connection—

Order No.		
6830	**Limb Bath,** with 6 lamps. Length 26 ins., across 15 ins. ...	£5 0 0
6834	**Trunk Bath,** with 12 lamps. Length 30 ins., across 23 ins. Fitted with switch so that 6 of the lamps can be switched off when desired	£8 0 0

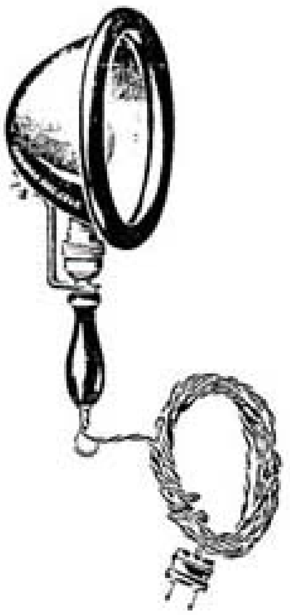
Any other sizes or shapes with more or less lamps made to order at proportionate prices.



Local Light and Heat Bath, for treatment of the **Shoulder.** Fitted with 3 lamps. The arm is passed through a hole at the bottom, the bath resting on the shoulder, while a strap passes across the chest and under the other arm to retain the bath in position.

Order No.		
6840	Complete, with 3 lamps, flexible cable, and plug for connecting ...	£4 5 0

When ordering any of the above please state voltage the lamps are to be for.



Hand Reflector. This little reflector is particularly convenient and serviceable for the application of light and heat to any local part, such as face, neck, hands, joints, &c., and for the relief of pain as neuralgia, &c. By reason of the finely plated parabolic reflector a most intense light and heat is thrown out, which can be regulated as desired by varying the distance at which it is held from the body.

Lamp holder fitted with switch. Holder and all parts finely plated. Polished wood handle with hook for hanging. Complete with high candle power lamp, length of flexible cable with plug or lamp-adaptor as preferred.

Order No.		
6850	Diam. of reflector 7 in....	£1 7 0

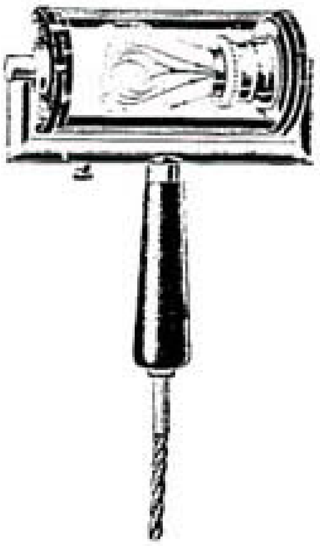
Special Crystal Glass Lamps, Red and Blue. These lamps are specially made for medical purposes, the usual everyday "dipped" or painted lamps being useless, suppressing the essential rays.

They are frequently used with both full body and local appliances, more especially the blue, which is of much service in nervous cases.

For any voltage, which please state. Candle power 25.

Order No.		s.	d.
6860	Blue, bayonet cap...	2	6 each.
6864	Red, ,, ,, ...	2	6 ,,

Screw pattern lamps are also supplied at the same prices.



Massage Roller, with revolving cylinder of glass with an incandescent lamp inside. Finely plated and finished, with polished wood handle and length of flexible cable with connecting plug. The lamp is easily replaced.

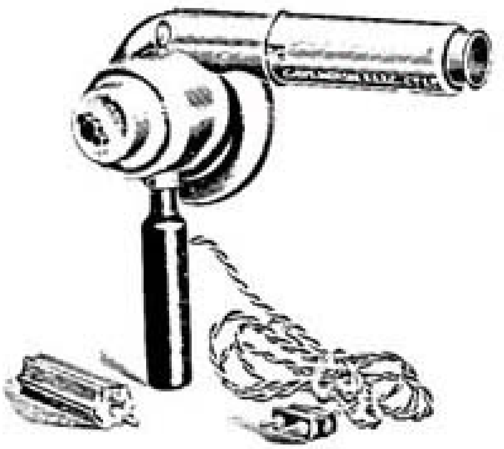
Order No.	
6870	£1 10 0

Spinal Reflector, for local treatment, especially of spine or other lengthy areas. With nickel plated reflector about 20 in. long by 8 in. wide, carrying 6 incandescent lamps. Reflector mounted on nickel plated floor stand with heavy enamelled iron foot on castors, and adjustable to any angle. Complete with lamps, flexible connecting cable and plug.

Order No.	
6880	£6 10 0

Photograph or illustration on request.

New Electric Hot Air Douche.



As described, and complete with length of flexible cable with pin plug or lamp adaptor. To connect to any main current. Please state voltage of main and if continuous current or alternating current. If alternating current please state periodicity as well as voltage.

Order No.		
6890	... ...	£2 5 0
6894	Spare Heater (state voltage) ...	0 1 0

Our New Hot Air Douche is of totally different design to the first patterns, offering many advantages and being superior all round. Instead of the motor being contained in the handle it is now fitted in the body of the machine, enabling it to be constructed in larger size and in better design. They now give no trouble whatever, whereas the earlier patterns were cut so fine that they were totally unreliable. Moreover, the position of the motor is now such that in drawing in the air by means of the fan so as to drive it out along the nozzle over the heater it automatically air-cools itself.

The Fan is directly fitted on the axle of the motor so that there is no means of transmission, such as a friction drive as occurred with the older types, causing loss of power, heating, and wear and tear.

The Heater consists of a fine wire wound round a porcelain tube, and is fitted with two brass pegs designed to fit into two sockets provided in the body of the douche. They may therefore be instantly replaced without tools by anyone. In other types the heater is built into the douche as an integral part, necessitating its return to the makers and a heavy charge each time such replacement is required.

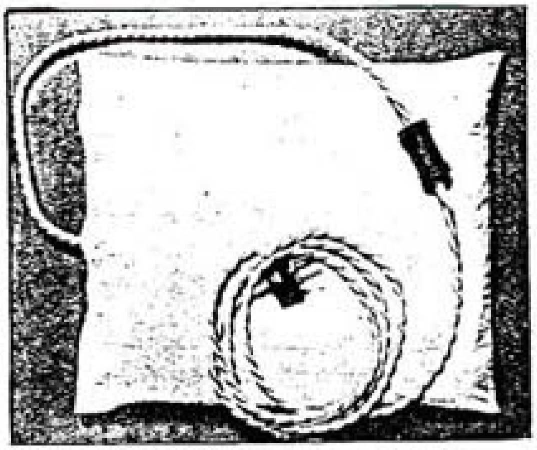
A Special Switch is fitted to the case of the douche as shown in illustration. By turning this once the motor is started and a stream of cold air passes out of the nozzle. On turning the switch again the heater is brought into use, and a stream of hot air is given in two or three seconds. A further turn of the switch stops the whole.

The metal casing and nozzle is of aluminium, and the whole very light and compact. The handle is of polished wood.

The douche consumes only little current, and may therefore be connected and worked from any ordinary wall socket or lamp-holder.

A great heat is obtained close to the nozzle, but perfect regulation is secured merely by varying the distance. A great volume of hot air is given, covering considerable area, of course controlled by distance of object from nozzle.

New Electric Thermo Compress.



As described, complete with Automatic cut-out regulating switch inside, 3 way regulating switch and length of flexible connecting cable with plug.
Size 15 in. × 12 in. Contained in a card case.

Special Sizes and Voltages to order.

For any voltage continous current or alternating current, which please state when ordering.

Order No.		£	s.	d.
6900	For any voltage from 100–250 volts	£1	15	0
6904	For 75 volts	1	17	6
6908	For 50 „	2	0	0
6912	For 25 „	2	0	0

Electric Compresses have long been in use for the local application of a dry heat, and the beneficial results following this form of treatment in cases of rheumatism, sciatica, lumbago, neuralgia and all similar complaints are well known, as also in the relief of abdominal and other pain.

Our new Compress is the last word in this form of appliance and it is being turned to a great variety of uses, not only as a fomentation pad but also as a "Hot water bottle," etc. The heat is obtained from resistance wires in asbestos, so constructed as to be absolutely flexible.

The round Plug-Switch introduced into the length of connecting cable can be turned to three positions, providing three degrees of heat. On No. 1 the lowest degree of temperature is obtained with a maximum of about 100° F. On No. 2 the maximum temperature obtainable is about 200° F. On No. 3 the maximum temperature runs up to about 300° F., and when this is reached the automatic cut-out switch comes into operation.

The Automatic Cut-Out Switch is fitted inside the compress itself, at one end; it is operated by heat and automatically switches off the current as soon as the maximum temperature, viz., about 300° F. is attained. As soon as the temperature has reduced somewhat in consequence of the cessation of the current, the switch automatically closes again to permit the current to flow, and in this way the heat is maintained at a high temperature while preventing any undue heating such as might be dangerous to patient, etc. This opening and closing of the circuit is quite automatic and needs no attention or adjustment whatsoever. It continues to take place all the while the compress is connected with the main.

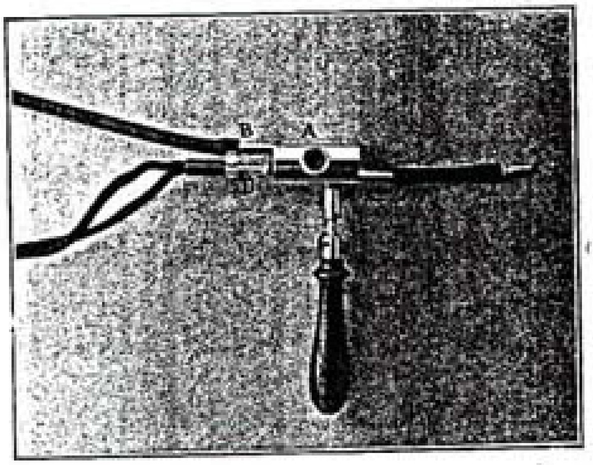
The advantages of this are obvious. The Pad may be left on the main for hours at a stretch without risk of burning patient, pad or bedclothes. With all other types such a proceeding would be impossible, and constant attendance is necessary to avoid risks of burning.

The current consumed by the compress is even less than that required by an ordinary electric lamp, so that the cost is negligible, actually only about one farthing per hour. For the same reason the compress can be connected and worked from any wall socket or lampholder, that is to say on any lighting circuit.

The Compress is very flexible, so that it can be wrapped round a joint, etc., when desired. The outer calico cover can be removed and washed. The compress should be connected to the main some little time before required for application, as, on account of the very small current consumed, it takes some 20 minutes or so to reach a high temperature. If wrapped in a cloth or doubled in half, etc., the heating up is facilitated, and the plug-switch should of course be on "3."

Hot Air Apparatus.

By Mr. Gay-French, for the Eustachian Tube



This is a most simple and convenient little device for obtaining a stream of hot air for treatment of the **Eustachian tube**. It consists of a nickel-plated metal cylinder about 1½ ins. by 1 in. diameter, inside which is a little platinum wire heater. A nipple is provided at either end, the one for attachment of rubber tube from the double-bellows, &c., and the other for the attachment of a rubber tube with a little end fitting for treatment.

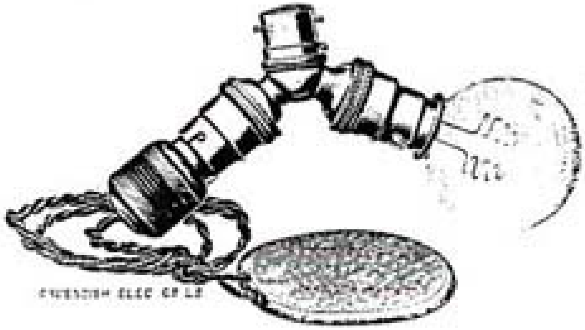
A window is provided in the cylinder so that the heater can be watched. The heater is worked from a transformer or accumulator exactly the same as a cautery burner, a rheostat being absolutely necessary in order to regulate the heater.

Two peg terminals are fitted so as to attach an ordinary cautery cable and the cylinder is carried on a little polished wood handle.

Care should be taken to reduce or stop the current immediately the air blower is stopped, so that the heater will not fuse.

Order No.		
6920	**Hot air apparatus**, as described	£1 17 6
6924	**Double-bellows**, for use with above	0 7 6
6928	**Cautery cable**, as Order No. 5080	0 5 6

Instead of the double-bellows, the apparatus is used by many in conjunction with a "Multinebuliser" so that hot medicated air is administered. To all who already possess a "Multinebuliser" the device is a most useful supplement.



Small Thermo Pad for the Eye, &c. Complete with flexible cable, lamp-adaptor, series lamp fitting and resistance lamp.

Order No.	
6940 ...	... £1 5 0

State voltage of main.

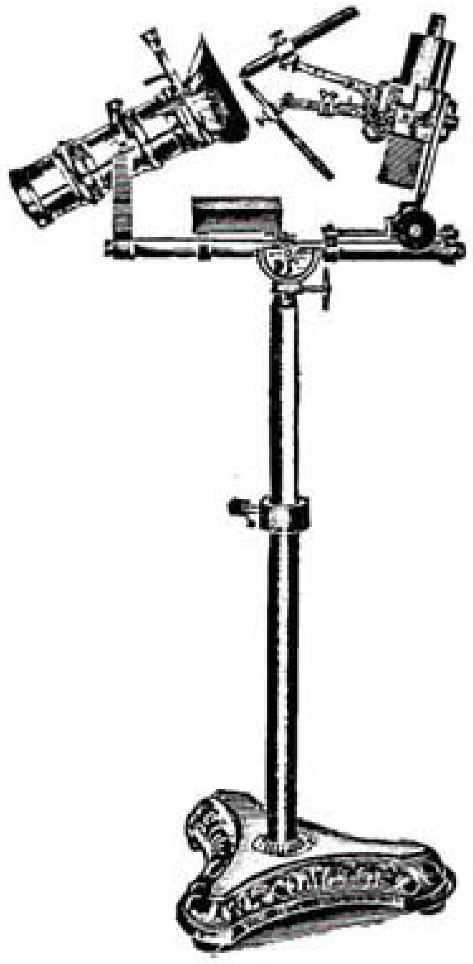
Finsen Reyn Lamp.

For the Finsen Light Treatment of Lupus and all Skin Diseases.

A great number of lamps for carrying out the Finsen light treatment of lupus and all skin diseases have been placed on the market since the original lamp by Finsen himself. Some have been constructed to burn with carbon electrodes, some with iron electrodes and electrodes of other metals, while yet another class have been constructed on the mercury vapour principle. Of all this variety of lamps the Finsen Reyn lamp has proved itself the most popular and the most successful, and we are accordingly listing same to the exclusion of all others.

The Finsen Reyn lamp is an automatic feed arc lamp burning carbon electrodes, and taking about 25 amperes. The concentrator tube is fitted with two systems of rock crystal lenses with a stationary or permanent water-cooling arrangement, and also a circulatory water-cooling.

The concentrator is adjustable to any angle on its support, and the whole top portion of the lamp may also be placed at any angle by means of a handle and cog movement. The automatic mechanism of the arc is of best design, and provided with a balance weight permitting the finest possible adjustment of the arc. The arc can be moved nearer to or farther from the concentrator by means of a rack movement. The heavy iron stand is telescopic, is finely enamelled and provided with castors. The concentrator tube and other fitments are finely nickel-plated. The whole lamp is of strong construction, well designed and beautifully finished. One or two further improvements are now introduced which the illustration does not show.



No. 6950.

Order No.				
6950	For any voltage. Including lengths of rubber tubes for water circulation and 5 pairs of carbons	£30	0	0
6960	If desired, extra adjustments can be fitted, namely, a handle and screw movement for raising and lowering the arc. Each carbon holder is fitted with a little handle and cog wheels so that they may be set to any angle. A handle and screw movement is fitted for moving the arc from side to side. These extra fitments permit of accurate adjustment of the arc in the best position in relation to the lenses of the concentrator. Extra	1	18	0

Finsen-Reyn Lamp.

Order No.				
6964	If fitted with automatic compression arrangement by Dr. Wichmann, rendering attendance unnecessary, extra ...	£2	0	0
6968	If with compressor lens by Dr. Levy Dorn, for bringing the focus of the light directly on to the part, extra	1	18	0

Switchboards and Resistances

For Finsen-Reyn Lamp.

Controlling Switchboard for Finsen-Reyn Lamp. Of white marble, with crank rheostat and studs for regulating the amperage with which the lamp burns and thereby its power. To burn the lamp up to 25 amperes, its maximum, with switch, china fuses and connecting terminals for main and for lamp.

Resistance coils suspended at back, in iron frame, on porcelain insulators. Best make and finish and all fitments of the best.

Order No.				
6980	For main up to 65 volts	£5	0	0
6982	For main up to 120 volts	6	5	0
6984	For main up to 250 volts	8	0	0
	If board fitted with ampere-meter to measure current feeding the lamp, the above prices increase	1	10	0
	If board without switch and fuses, but otherwise as above, the respective prices decrease	1	10	0

A Resistance is absolutely necessary for the Finsen-Reyn Lamp, as with every arc lamp, therefore one of the above must be chosen.

When ordering either the lamp or the resistance board, please state the voltage of the main, and if it be continuous current or alternating current. If the latter, state also the periodicity as well as the voltage.

These switchboards can be made in combination with boards for other purposes, such as x-rays, cautery, light, &c., if desired, and in some cases much saving is effected over the price of separate boards. Information and prices gladly furnished on request.

Earthfree Universal Apparatus.

The term "**Earthfree**" is used to denote a machine free from all possibility of earth shocks. In the earlier types of apparatus the main current was used for all the different treatments, being reduced in voltage for galvanic current and otherwise modified for the several purposes. It was, however, always the same main current. With the Earthfree Universal Apparatus we would explain that the motor is not merely a motor transformer, but is a motor generator. The current from the main imparts energy to the motor, but otherwise does not enter into the question at all. The armature of the motor is double wound, so that when running as a motor driven by the main current it also runs as a generator or dynamo, generating the current which is subsequently utilised in the treatment of the patient.

The motor can be operated by any current up to 250 volts, but the generator does not generate a voltage more than about 60 to 80, this representing the maximum voltage ever required for galvanic treatment. Thus it will be understood that two distinct advantages are secured, viz.:—

1. Only a comparatively low voltage is generated and therefore no risk of dangerous shocks.

2. The current generated is absolutely independent of the main, and therefore no fear of high voltage shocks and no possibility of shocks to earth, such as are liable to occur under other conditions.

Earth shocks are always liable to arise when working on a damp floor, when working on the concrete floors of hospitals, and, above all, when working with hydro-electric baths. For this reason it is necessary to take great precaution to insulate the waste pipe of a water bath from earth, usually effected by cutting away part of its length and joining with rubber tube, or by letting a smaller pipe empty inside a larger one without any connection between them. Unpleasant shocks are frequently experienced when holding electrodes under a tap to moisten them and in other such respects when one is little suspecting it.

The Earthfree machine, therefore, constitutes a distinct improvement on all earlier appliances, as also over those appliances of inferior construction which seek to effect a little saving in cost, which, in this case, even more so than usual, is essentially at the sacrifice of efficiency.

Galvanisation.

Of all the various currents utilised in electro-therapeutics the galvanic current is by far the most useful. Even if only on account of Ionic Medication this statement would be strictly true, but the galvanic current also comes into question for electrolysis in the treatment of growths and for removing superfluous hair, while still further the galvanic current is of the greatest benefit in a great variety of cases, such as neuritis, rheumatism, etc.

In order to overcome the enormous resistance of the skin and to create powerful currents (milli-amperes) a tension up to about 80 volts is necessary, and this is accordingly generated by the apparatus. By means of the volt regulator or rheostat provided, this current may be regulated in the finest possible degree, and this is very essential as the current must be made to creep in and out. It will be found in practice, if the current can be regulated very gradually, that the patient can be induced to stand more. After a few minutes treatment it will invariably be found that the milli-amperage can be increased if the rheostat be moved very gradually, which operation can be repeated several times before the finish of the treatment.

Milli-Amperemeter. The Milli-Amperemeter is the instrument which measures the milli-amperage administered to the patient. They vary in size and type and some are provided with one reading only, some with two, and the best instruments with three. Three readings serve to fulfil every condition. A low reading (0–5) serves to measure by fractions of a milli-ampere the weak currents, such as are applied to the brain or other sensitive parts, internal, etc. The middle reading (0–50) is for general application, such as Ionic Medication, electrolysis of growths and general galvanic treatments. On this reading the instrument indicates each separate milli-ampere. The highest reading (0–500) is necessary for very strong currents—up to as much as 150 milli-amperes are now used in Ionic Medication, and very much stronger currents still for hydro-electric purposes.

The instrument fitted to the apparatus is one of the large size and best dead-beat moving-coil type, provided with three readings as just described. It will be found illustrated and described on pages 11 and 12.

Pole Reverser. The purpose of a pole reverser is to permit of the instant reversal of direction of the galvanic current. Just at the moment that this is effected a more or less degree of shock is caused to the patient, the violence of the shock depending entirely upon the milli-amperage circulating. If only a very weak current is traversing the patient the shock can be quite inappreciable while with stronger currents very violent muscular contractions are set up, and it therefore fulfils a valuable purpose in electro-diagnostics for testing the degeneration of muscles, etc. A further important use of the pole reverser arises in those cases where internal treatment is applied, such as with a copper probe in dysmenorrhea. In these cases the electrode is firmly gripped by the coagulation set up, so that hemorrhage would be caused if any attempt were made to withdraw it. The current is therefore gradually reduced to zero, after which the polarity is reversed, when it will be found in a very few minutes that the electrode can be removed easily.

Sinusoidal Faradisation.

The Sinusoidal Faradic current has now almost entirely replaced the old method of Faradisation by means of an Induction Coil. With the coil the necessary interruptions are effected by a vibrating spring, the interruptions given by same being unavoidably irregular. In the case of the Sinusoidal-Alternating current the interruptions are made by slip rings on the armature of the motor, so that they are always absolutely regular and even, with the result that the current is much more pleasant to bear and is devoid of the occasional violent contractions set up by the Induction Coil. A sketch of the Induction Coil current shows it, speaking generally, as a high mountain peak which means that it rapidly attains its maximum tension and just as rapidly drops, this sudden variation causing the violent muscular contractions. The Sinusoidal current has a wave form of sinus shape as its name implies. It gradually goes up to its maximum tension and gradually comes down, so that in comparison it is a wavy current as compared with a decidedly jerky current.

The therapeutic action of the two currents is very similar, and although the Faradic current would be preferred for setting up muscular contractions, nevertheless a strong Sinusoidal current will do the same and the interruptions being regular it is much more pleasant to bear. The purpose of the Faradic current is almost entirely for creating strong muscular contractions, whereas the Sinusoidal current is much more convenient and efficient for electrisation.

Galvano-Faradisation.

This combination of the Galvanic and Sinusoidal-Faradic currents is of service in certain cases, and is obtained merely by switching on both currents in exactly the same way as if they were being utilised separately. When this current is in use the milli-amperemeter still continues to indicate the strength of the galvanic current.

Cautery.

The current necessary for Cautery is very heavy, that is to say, up to some 30 amperes and with a voltage of 4 to 8. Herein lies another important advantage of the Universal machine. It can be connected to any ordinary wall plug or to any ordinary electric lamp holder, and even when giving 30 amperes to heat a large burner its consumption from the main is only about one ampere. In the ordinary way 30 amperes of current would necessitate specially heavy cables such as are never found in the ordinary house, while of course the enormous saving in cost is apparent. Perfect regulation is provided by means of the Cautery Rheostat so that each burner from the smallest eye burner to the large burners requiring a current up to 30 amperes can equally well be used. Porcelain burners can of course be used, and any description of snare.

A Motor Transformer for Cautery and Light only, costs nearly as much as the Universal machine with all its additional advantages. The Universal machines have found a very ready sale, and for this reason it is possible to manufacture them in great quantities and so to keep the price down very considerably.

Light.

The voltage required for the various surgical lamps varies from 2 to 12 volts. Any lamp between these extremes can be regulated in the finest degree to burn it to best advantage without overstraining. The earlier appliances and those of the present day of inferior construction do not begin from zero, with the result that even on the weakest point the current is too strong for the smallest lamps as used in Urethroscopes, etc., with the result that they are overstrained and rapidly blacken and burn up. With Cystoscopes and certain other lamps it is of importance that the lamp can just be burned to an exact degree of brightness as may be required.

Cautery and Light.

In the older types of machine Cautery and Light were not independent of one another. If the two were used simultaneously it was very difficult to regulate each to the extent desired, and, moreover, if one released his pressure on the switch of the Cautery burner the current at once rushed to the lamp and burnt it through. In our own Universal machine Cautery and Light are quite independent. They may be used simultaneously with perfect regulation

Earthfree Universal Apparatus.

CONSTRUCTION.

The base of the machine measures only 18 in. by 12 in. so that it is particularly compact and convenient. The base is of cast iron finely enamelled, and with an iron plate closing the bottom with four little rubber feet to stand upon.

The motor generator is of the enclosed type, which offers the advantage of preventing any dust or foreign matter getting into it, thereby ensuring smooth and reliable working. It is of very best design and construction with every refinement, and is splendidly finished and nickel-plated.

Each motor is provided with a fitting for working vibrators, surgical drills, pumps &c., as explained elsewhere. This fitting is standardised and universal for all our own instruments.

The rheostats provided are all of the very best turning type. They provide a very smooth and regular adjustment and are particularly neat and convenient in every way. They possess distinct advantages over those types of rheostat operated by a pulling rod or sliding contact working in an opening. The former are liable to get in the way when the machine is in use, and the latter admit dust and dirt into the interior of the machine. Our turning rheostats are obviously more expensive to make than the usual types but the price of the machine is not more than those with inferior fitments. The rheostat knobs are of ebonite. A separate rheostat is provided for each purpose, namely, for light, galvanisation, sinusoidal-faradisation, cautery and motor, each distinctly labelled accordingly. The motor rheostat also switches on and off the current to start the motor. Thus after use when the rheostat is brought back to weak it stops the motor and thus ensures that the motor is always started again on weak or slow. This is essential, as it is harmful to any motor to be started off suddenly at full speed.

A selecting switch or Watteville key is provided giving galvanic current, sinusoidal current or galvano-sinusoidal current, at the same two terminals according to the position to which the switch is turned. Thus it is possible to obtain either of the currents or to change them without having to remove any wires or electrodes.

A pole reverser is also fitted which has the purpose of changing the direction or polarity of the galvanic current. At the instant of using the reverser a shock is caused to the patient varying in violence according to the milli-amperage circulating. If it be desired to reverse the current without producing a shock it is only necessary of each, and if the Cautery burner be switched off there only occurs a difference in the Light barely to be appreciated. Even to the present day Cautery and Light are not entirely independent of one another in machines of inferior construction, seeking to effect a slight saving in cost at the usual sacrifice of efficiency.

Motor Power.

The motor of the apparatus is of best design and construction and of about one-eighth horse power, so that it is capable of fulfilling all ordinary purposes. It is arranged to work the flexible shaft which in turn carries a surgical handpiece for drills, burrs, etc., or the shaft will also carry a vibrator handpiece; for driving the air pump for tympanic membrane massage, the large pump for pneumo massage of the body; for driving centrifuges, fans, the interrupting device for intermittent galvanic current and other such appliances, the fitting being universal. The speed of the motor is regulated by the rheostat provided. It will thus be seen that the motor power is turned to very good use, thereby adding further to the advantages of the apparatus in general.

to first bring the galvanic rheostat back to zero. Otherwise the shocks are utilised for the purpose of electro-diagnostics for testing the degeneration of muscles, &c. With only one or two milli-amperes circulating the shock is very slight, but very powerful shocks are possible with heavier milli-amperage traversing the patient. As the galvanic current can be accurately measured it follows that one is provided with an accurate means of comparison in diagnostic cases. The pole reverser is of great use in many cases where it be desired to treat internally by means of copper or other sounds. These electrodes are sometimes held tightly by the coagulation set up and if any attempt were made to withdraw them hemorrhage would inevitably result. The galvanic current is therefore brought back to zero and the current reversed for a few minutes, after which the electrode can be withdrawn easily.

The third switch fitted to the apparatus is merely to switch in the transforming coils for cautery, light and sinusoidal current and for switching out the transforming coils when galvanic current is being used or when motor power is being used.

Milli-amperemeter.

The milli-amperemeter is of the very best D'Arsonval moving coil type, dead-beat and of the utmost precision. It is about 4½ in. diameter, supported on pillars and provided with three readings, viz: 0–5, 0–50, 0–500 with centre zero. The needle moves to the one side with the pole reverser on normal and to the opposite side of zero when the polarity be reversed.

The lowest reading 0–5 m.a. shows each one-fifth part of a milli-ampere and is therefore very accurate and convenient for registering very weak currents as are used in treatment of the face, head, internally, &c.

The middle reading 0–50 m.a. is for all general purposes, each division of the scale representing two milli-amperes. The scale is very clear and this reading will serve for all general work perfectly.

The highest reading 0–500 m.a. is for use with very strong currents such as with ionic medication and especially for electric water baths. It will thus be understood that the instrument serves exactly the same purpose as three distinct instruments and enables a reading to be chosen which will show most clearly the amount of current being administered. This instrument is described still more fully on pages 11 and 12.

The machine is completed by two nickel-plated handles and by a length of flexible cable with plug for connecting to the main.

Earthfree Universal Apparatus.

Described in detail on preceding pages.

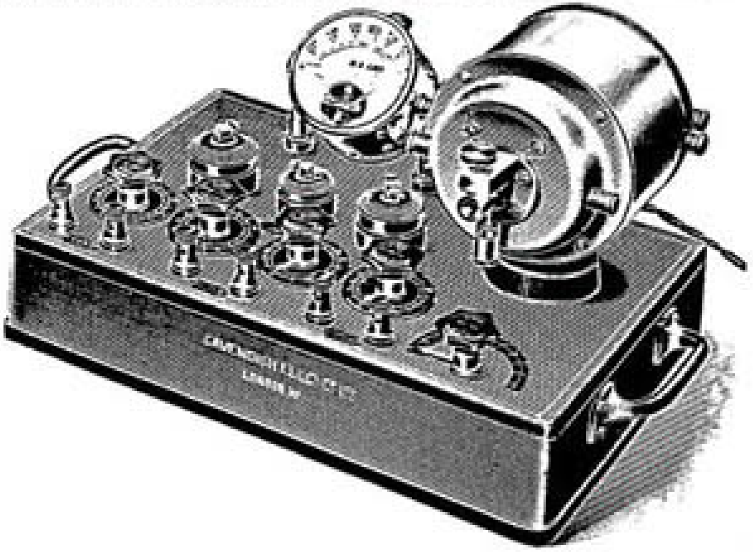
The term "Universal Apparatus" is used nowadays to denote appliances providing all the different currents usea in electro-therapeutics,while at the same time providing motor power for operating surgical drills, ear pumps, air pumps, centrifuges, vibrators and other such instruments.

Actually our New Universal Apparatus provides :—

Galvanic current (ionic medication, electrolysis)
Sinusoidal Faradic current
Galvano-sinusoidal current
Cautery
Light

Motor power for driving surgical drills, trephines, burrs, &c.; vibratory massage instruments, air pumps for massage of tympanic membrane and for pneumo-massage; centrifuges, fans, polishing and sharpening instruments, &c., all of which are listed and described later in this catalogue.

The motor is also arranged to drive the interrupting device described on page 130, whereby intermittent-galvanic current by Leduc is also obtained.

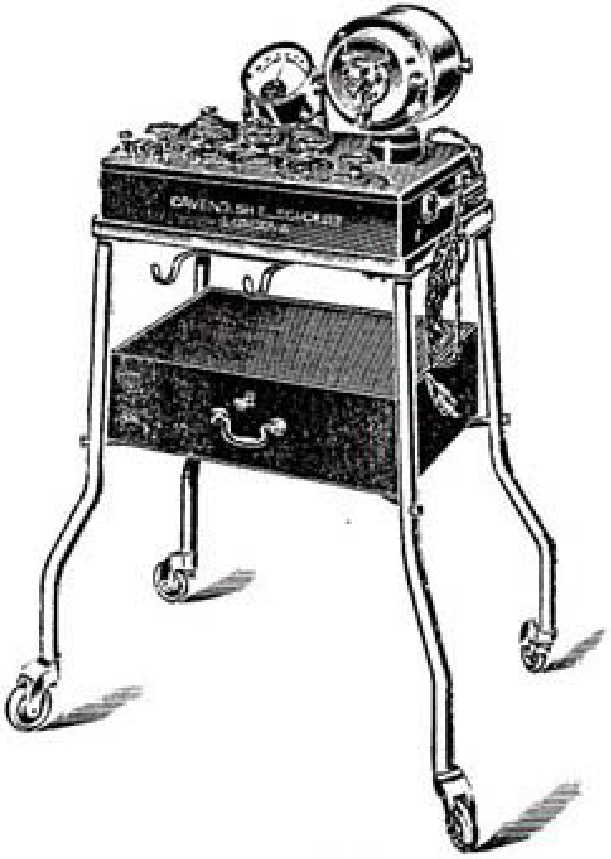


The term "Earthfree" means that all the currents used in the treatments are generated in the motor dynamo of the apparatus and are therefore quite independent of the main. The main is only required to drive the motor, which is double wound and so generates the currents as a dynamo. See detailed description of this on page 100.

No dangerous high voltages. No earth shocks.

Other machines, though perhaps looking the same, are not "Earthfree," but utilise the high voltage main current through resistances.

Earthfree Universal Apparatus.



Prices:

Order No.		£	s.	d.
7000	For continuous current main up to 120 volts	£22	10	0
7004	For continuous current from 120 up to 250 volts	23	10	0
7010	For alternating current main up to 120 volts	29	10	0
7014	For alternating current from 120 up to 250 volts	30	10	0
7020	For accumulators, 12 volts. Including a 6-cell (12 volt) accumulator of best quality. With sealed celluloid cells (unbreakable). Mounted in a strong polished wood case with handles. Capacity 60 ampere-hours, actual	35	0	0
7030	**Table** to carry the machine, of steel tubes, finely plated. With large ball-bearing, rubber-tyred castors. Superior finish ...	3	5	0
7034	**Same**, but with polished wood drawer, 4 ins. deep, with handle, lock and key, to contain accessories. In use the accessories can be placed on top, there being a raised edge. (Fig.)	4	5	0

If the machine be fitted with an induction coil for ordinary faradic current, with adjustable hammer interrupter on top and with regulator, the price increases 3 10 0

Special machines without cautery and light, for 4-cell bath, &c., see next page.

Earthfree Universal Apparatus.

Special Model.

Providing Galvanic Current ·Ionic Medication, Electrolysis', Faradic Current, Galvano-Faradic Current and Sinusoidal-Alternating Current, but not Cautery nd Light.

This is a smaller model than the standard pattern. and does not provide Cautery and Light, but it provides ordinary Faradic Current as well as Sinusoidal Current.

The Motor-Transformer is double-wound, and generates all the currents used in treating the patient. The main current is only utilised to drive the Motor, so that all currents are "**Earthfree**" . . . no risk of earth shocks.

In general, this apparatus follows the lines of the larger model described in detail. The same precision turning rheostats are fitted, permitting finest possible regulation of the strength of the galvanic and sinusoidal currents, and providing regulation of the speed of the motor-generator whereby the rapidity of the alternations of the Sinusoidal current can be varied, and also the rapidity of the vibrations when used to drive our vibrator No. 7360, the rapidity of the interruptions when used to drive the Leduc interrupter, No. 7480, &c.

A separate Regulator is provided to permit of perfect regulation of the strength of the Faradic current, and the hammer interrupter is mounted on the top of the case so as to be easily accessible for adjustment.

A Pole-Reverser is fitted for reversing the galvanic current as explained in connection with the standard model.

A Watteville Switch is also fitted, giving galvanic, faradic and galvano-Faradic currents at the same terminals.

The Milli-Ammeter is of best D'Arsonval dead-beat, moving-coil type, with two readings, viz., 0-15, 0-150 as described under Order No. 170.

The 4-Cell Bath Commutator, described on page 116, is also mounted on the base, thus rendering the machine specially convenient for use with the 4-cell bath, though, of course, it can be used with electrodes in the ordinary manner.

Prices.

Order No.		£	s.	d.
7050	For continuous current main up to 120 volts	**20**	**0**	**0**
7054	For continuous current from 120 volts up to 250 volts	**21**	**0**	**0**
7060	For alternating current main up to 120 volts	**27**	**15**	**0**
7064	For alternating current from 120 volts up to 250 volts	**28**	**15**	**0**
7070	**Table** to carry the machine, of iron tubes, nicely enamelled and fitted with castors	**1**	**15**	**0**

4-Cell Bath by Dr. Schnée.

The 4-Cell Bath by Dr. Schnée marks an important advance in electrisation of the human body both locally and full body. With it any of the different electric currents can be administered to the patient in any desired manner. The dosage can be accurately regulated and measured, strong currents can be administered without pain and depth of action is assured. Not only is depth of action assured, but moreover, accurate localisation is effected. To make these points clear it is necessary to draw comparison with the other methods in vogue.

In the case of an ordinary hydro-electric bath, that is to say in the case of a full body porcelain, wood or other slipper bath, the current is conducted to the water by means of two electrodes placed one at the head and one at the foot of the vessel. When the current is switched on it follows that a clear course is opened to it from one pole to the other by means of the water which is comparatively a good conductor. The human body constitutes a very high resistance so that the current naturally prefers to traverse the water in preference. When, therefore, the patient is in the water, by far the greater part of the current traverses the water from one electrode to the other, leaving only a small portion to pass through the patient's body. Just what this amount of current is, it is not possible to measure. One can measure the total current given to the water but cannot measure the proportion that the patient receives, and therefore, it is not possible to prescribe a given dose, and consequently one works quite in the dark with galvanic current.

A further objection to the full body bath is that no depth of action can be ensured. The patient's skin being saturated with water the current is able to flow superficially over the surface, whereas if the skin were dry, it would force the current to penetrate deeper in order to find suitable moist conducting media. A further objection is that many cases cannot be treated in such a bath on account of the reclining position or on account of the difficulty of getting the patient in and out.

The advantage of the 4-Cell Bath system over electrisation by means of ordinary pad electrodes on the body lies in the following facts. The intensity of current that can be borne by a patient depends entirely upon the extent of diffusion of such current, the diffusion of current in turn depending upon the extent of surface of electrode in contact with the body. If large pad electrodes are utilised in order to attempt to secure large superficial contact, their whole success depends upon securing an even contact over the whole surface, which is very difficult. On account of the irregular surface that the body presents it is hardly practical to get an electrode which takes to its contour and which exerts an even, uniform pressure throughout its whole surface. Wherever the pressure is greater, such as where the electrode rests on raised parts of the body, there the current density is greatest and any attempt at forcing a strong current results in an unendurable burning sensation at those points.

In the case of the cells the water itself actually constitutes the electrode in contact with the body, so that the extent of superficial contact can be adjusted as desired merely by immersing more or less of the hands or feet in the baths. Water presses equally in all directions, so that the current enters equally over a very great surface. For this reason very heavy doses can be administered without pain. This fact renders the cells particularly suitable for Ionic Medication, because very heavy currents have been found necessary to produce the best results, even currents so strong as up to 150 milli-amperes. The simple addition of medicaments into the water of a cell or cells at once renders the bath suitable for the best Ionic Medication.

Dosage and Direction.—It has been explained above that it is not possible to measure the amount of current administered to a patient when in a full water bath, but this may be accomplished with absolute accuracy in the case of the 4-Cell Bath. Supposing a patient sits with hands and wrists in the two arm cells. The positive pole is connected to the water of one cell and the negative pole to the water of the other. The patient's arms and shoulders constitute the only connection between the two poles and therefore they become part of the whole circuit, so that what the milli-amperemeter registers as going to the water must signify the dose being administered to the patient.

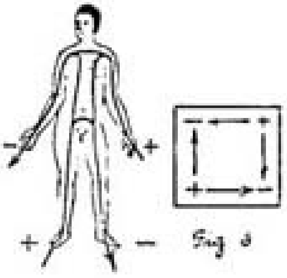


Fig 6

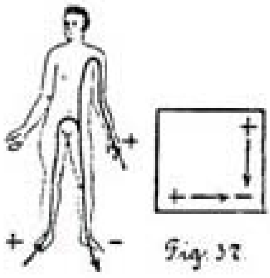


Fig. 37

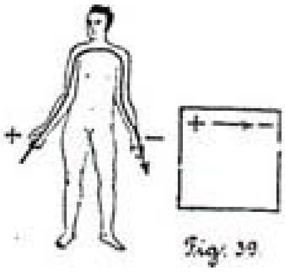


Fig. 39

In the same way one is enabled to tell and to control the direction of the current and so to influence any part of the body desired. More than fifty ways of switching the current through the body are possible, effected in the most simple manner by means of our special commutator as described on pages 115 and 116.

At the same time one is assured of depth of action. In the instance mentioned above the patient's hands and wrists are immersed in the water but the arms and shoulders remain perfectly dry. Therefore, on reaching the level of the water, the current is compelled to go into the deeper tissues to find a moist conducting medium. The human skin in a dry state does not conduct the electric current.

Two, three or four cells may be used at a time, so that the current may be sent up the two arms or up the two legs, up either arm and down either leg, or up either leg to either arm, or up two arms and down one leg or up two legs and down one arm and so on. Then again the current can be made to travel either up a limb (or limbs) or down a limb (or limbs), that is to say, either with the flow of the blood or against it. From these various methods of switching it will be understood that the current can be directed through the body in any direction desired, thus influencing any of the internal organs. If wishing to give concentrated treatment to any one limb the current may be sent up three limbs (all switched positive pole), and may be led away down the particular limb as the only outlet (switched negative pole).

The other advantages of the 4-Cell Bath system are that no expensive system of hot water arrangements are necessary. The room does not become saturated by the steam as with a full bath. There is no undressing, appreciated by patients and effecting a great saving of time. The 4-Cell Bath can be used in any consulting room which is out of question with the full body bath.

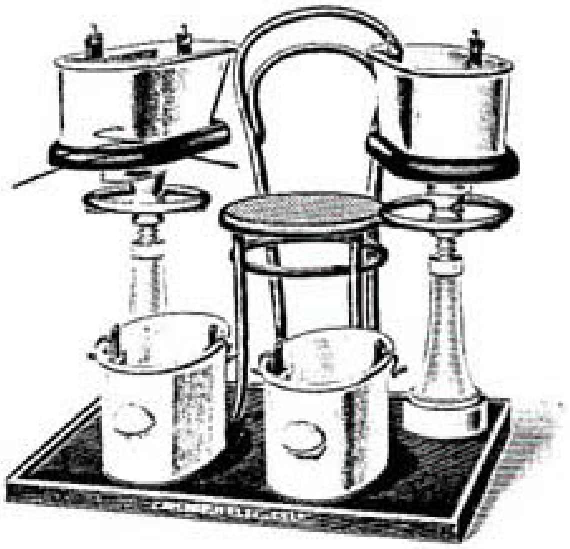
The 4-Cell Bath has been supplied to all the large hospitals, hydropathics and similar institutions, and many thousands are in use in doctors' consulting rooms.

Ionic Medication.—Now that Ionic Medication is being so universally taken up, the 4-Cell Bath will come more and more into service since it is most eminently suited for this treatment. Even if a pad saturated in the medicament be placed on the affected part (instead of using the medicament in the cell) still there is nothing better than a cell with plain water as the indifferent electrode. Very strong currents have been found necessary in many cases treated by the Ionic method and such strong currents are really only practicable by the use of cells for reasons explained in detail above.

The 4-Cell Bath, by Dr. Schnée.

The ideal method of administering the various electric currents to the body. Galvanic, faradic, sinusoidal, intermittent-galvanic, pulsating currents and combined currents can be utilised, whether derived from universal machines, switchboards, transformers or batteries. The apparatus has been fully described on preceding pages, but a brief summary of its advantages may be given as follows:—

1. Possibility of administering intense currents without pain, because of the enormous and even electrode surface.
2. Possibility of directing the currents through the body in any manner desired, thus securing its influence on any special organs or parts and either full-body or local.
3. Absolute measurement of dosage and constant even flow of current. Perfect control.
4. Depth of action, because the body remains dry and the current is compelled to penetrate in order to find moist conducting media.
5. Suitability for consulting room use, because of small size; no necessity for elaborate hot water arrangements; no steam; no removal of clothing, and consequently no waste of time.
6. Low initial cost and practically no maintenance expenses.



Special 4-cell bath model Universal machine providing galvanic current (ionic medication, electrolysis), faradic current, galvano-faradic current and sinusoidal-alternating current, motor for vibrators, &c. Listed on page 109.

4-Cell Bath Chair,

As illustrated on previous page.

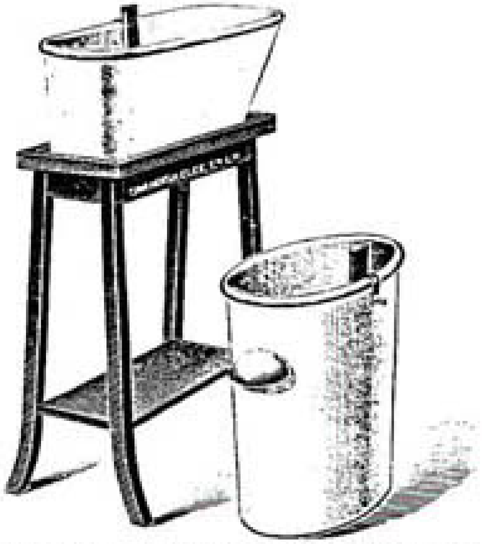
The two supports for the arm cells are of iron, and into each screws a strong threaded rod with a hand-wheel by means of which the cells can be adjusted to the most convenient height to suit each patient. They are independently adjustable, as this is often necessary with rheumatic conditions of the shoulders. The two cells rest upon two strong wooden trays or bases, each with a pivot or bearing beneath, enabling the cells to be adjusted wider apart by means of another short arm connecting from the bearings to the top of the threaded rods.

The iron supports are white enamelled, the hand-wheels plated and the wooden trays polished Mounted on a strong wooden base covered linoleum with polished edges. The whole well and strongly made.

The four cells are of best quality porcelain, finely white glazed inside and out. Each is fitted with two porcelain pockets carrying carbon plate electrodes with plated terminals. The advantage of two electrodes is to secure better diffusion of the current, while permitting any one cell to be used for bi-polar treatment of hands and feet when desired without trouble. The pockets prevent the patient from touching the carbons.

The arm cells slope away at the rear to the same angle as that made by the upper arm when in the cell. The white foot cells are now much reduced in height, being much more convenient to get the legs into and being easier to fill and to lift. They are fitted with two handles for carrying.

Order No.				
7080	**Complete** with 4 **White Porcelain Cells**, each with two pockets with two carbon electrodes and terminals, as described	£15	0	0
7084	**Complete** with 4 **Yellow Glazed Cells**, each with carbon electrode and terminal fitting with hook	10	10	0



Pedestal No. 7098, with cells Nos. 7094 and 7096.

White Porcelain Cells, each fitted with two pockets with two carbon electrodes and terminals, as described above.

Order No.		Length.	Width.	Depth.				
7090	Foot cells	17in.	10in.	9in.	each	1	16	0
7092	Arm cells	25in.	9in.	7in.	,,	1	16	0

Yellow Glazed Earthenware Cells, each with one carbon electrode with plated hook to hang on edge of cell, with terminal. (Figs.)

Order No.		Length.	Width.	Depth.				
7094	Foot cells	17in.	10in.	15in.	each	0	16	0
7096	Arm cells	25in.	9in.	7in.	,,	0	14	0

Polished Wood Pedestals, to support the arm cells at a convenient height. Well made, with shelf and with lino on top beneath the cell. (Fig.)

Order No.					
7098	... ...	each	0	17	6

Carbon Plate Electrodes, with terminal fitting.

Order No.					
7100	For cells Nos. 7090, 7092, 7096	each	0	2	6
7102	For foot cell, No. 7094 ... ... ,,		0	3	6

Two carbons in a cell offer the advantage of better diffusion of the current. Also they permit bi-polar treatment by making one positive and one negative, thus being suitable for treating the hands and feet locally.

4-Cell Bath Commutator.

This commutator is used in conjunction with the Universal machine, transformer, switchboard or battery, whichever may be used for deriving the current. The current or currents are led to the commutator by connecting two wires from the apparatus in use to the two terminals on the commutator, the working and regulating being carried out exactly as usual.

From the four terminals of commutator wires are connected to the corresponding cells of the 4-Cell Bath. If the cells have two electrodes in each, then these wires are simply branched or forked at the end to suit.

The commutator has four crank handles, each with three contact studs, the centre one of each three being blank so as to allow of any cell or cells being switched out of use. The outside studs of each set of three are marked + (positive) and − (negative). Each crank handle controls one cell; they are all labelled "Right Arm," "Right Leg," &c., and should be connected to their respective cells.

By this simple switching arrangement it is possible to direct the currents through the body in any direction desired, either full-body or locally and with the polarity as desired.

For instance, if the "Right Arm" crank be placed on the + stud, the "Left Arm" crank on the − stud, with the other two cranks on the centre studs (blank), then the current will travel up the right arm, across the shoulders and down the left arm. (See Fig. 39, Page 111.)

If the "Left Arm" crank be switched on +, the "Right Foot" switched on +, and the "Left Foot" switched on − (right arm crank on blank), then the current will travel up the left arm and up the right leg and down the left leg. (See Fig. 37, Page 111.)

If "Left Arm" +, "Right Arm" −, "Right Foot" +, "Left Foot" −, the current would travel up the left arm, across the chest and down the right arm, at the same time it will also travel up the left arm and down the left leg. It will also travel up the right leg and down the left leg, up the right leg and down the right arm, thus giving a full-body treatment, since every part comes within its influence. (See Fig. 6, Page 111.)

Thus, it will be understood that the different currents can be directed through the body in any direction desired, and so made to exert their influence as may be required in each individual case. More than 50 different methods of switching are possible, and may be accomplished in the most simple manner imaginable by merely moving the four crank handles of the commutator, there being no necessity for altering any wires or connections whatever.

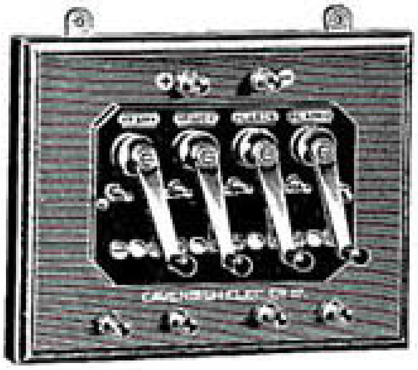
Any two cells can be used, one switched positive and the other negative.

Any three cells can be used, one switched positive and two negative, or two positive and one negative.

Four cells can be used, one switched positive and three negative, two positive and two negative, or one negative and three positive.

In all cases it must be borne in mind that at least one cell must be switched of opposite polarity to the others, otherwise there is no circuit.

If wishing to use one cell only for bi-polar treatment of hands or feet, this is easily accomplished by removing one of the carbon electrodes and replacing it by one from another cell, afterwards switching one carbon positive and one negative by means of the two crank handles concerned.



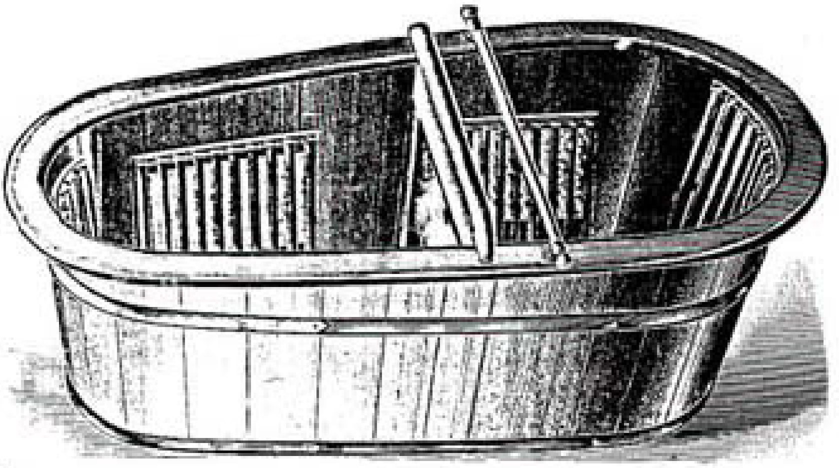
Commutator for 4-Cell Bath, with four crank switches each with three studs, +, nil, −, permitting any cell being switched positive, negative or out of action, according to requirements. The four cranks with studs and stops are mounted on a polished ebonite base, which is mounted again on a polished wood board. Two terminals are provided for connection to the Universal machine, switchboard, transformer or battery, whichever may happen to be the source of the currents. Four terminals are provided for connecting to the four cells. The whole of best design, make and finish.

Order No.		
7110	... ...	£2 0 0
7120	**Connecting Cables,** for connecting the four cells with commutator. A set of four cables each with terminal at one end for terminal of commutator while the other end is branched or forked, and provided with two terminals to connect to the two carbons in each cell. They are strong, rubber insulated. Each about 8 ft. long ... ... per set	0 12 6

The commutator can be mounted permanently on any of our switchboards, such as those on Pages 40–44, if ordering a board, the charge being **£2 0 0**, *i.e.*, the price of the commutator itself.

Hydro-Electric Baths.

For electrisation of the body with galvanic, faradic and sinusoidal currents derived from the various switchboards or other apparatus suitable.



Order No.		
7130	**Hydro-electric Bath,** of selected wood, cheap type, inside painted with white oil colour. Well and strongly made ...	£4 10 0
7132	**Hydro-electric Bath,** of best selected pitch pine, with finely rounded and polished solid mahogany edge. Superior make and finish. (Fig.)	9 0 0

Hydro-electric Bath, with fixed electrodes. Cheap type, painted inside with white oil colour. The electrodes are fitted with wooden insulating frames to prevent the bather touching them. The monopole rod is finely nickel-plated and is removable, being provided with pegs fitting into sockets at each side.

Order No.		
7136	With 4 aluminium electrodes and monopole rod	£10 10 0
7138	With 6 „ „ „ „ „	12 12 0
7140	With 8 „ „ „ „ „	14 14 0

If with carbon electrodes and monopole rod the prices increase **£3 0 0, £4 0 0** and **£5 0 0** respectively.

Hydro-electric Bath, with fixed electrodes, best type, in selected pitch pine with polished mahogany rim. Electrodes with insulating frames as above and with monopole rod as above.

Order No.		
7142	With 4 aluminium electrodes and monopole rod	£15 0 0
7144	With 6 „ „ „ „ „	17 0 0
7146	With 8 „ „ „ „ „	19 0 0

If with carbon electrodes and monopole rod the prices increase **£3 0 0, £4 0 0** and **£5 0 0** respectively.

Electric Sitz Bath.

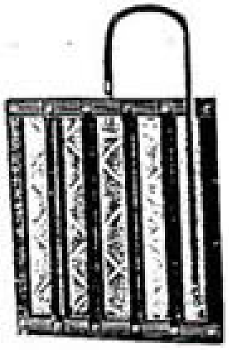
Of best selected pitch pine, with finely rounded and polished mahogany edge. With 3 aluminium electrodes arranged one at the back and one at each side, with wooden insulating frames. Also with an aluminium electrode on the bottom, covered by a seat board perforated with holes. Best make and finish.

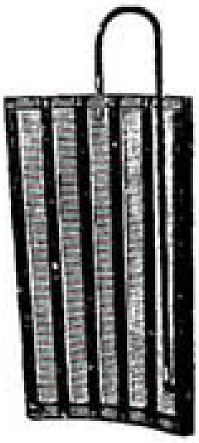
Order No.		
7150	... ...	£11 0 0

The approximate dimensions of the Hydro-electric Baths are : length 70 ins.

Width across shoulders 36 ins., depth 36 ins.

Hydro-Electric Baths.





Electrodes for Hydro-Electric Baths, for placing in the Wooden Baths Nos. 7180 and 7182, or the Porcelain Baths on previous page. With strong teak insulating frame; with strong copper connecting wire covered with rubber tubing and fitted with terminal on end. The wires can be bent over the edge of the bath.

Order No.		s.	d.
7200	Straight shape, size about 15 in. × 11 in.	14	0
7204	Curved shape, size about 15 in. × 11 in.	16	0
7208	**Same,** but contained in a flannel bag instead of having the wooden insulating frame. Straight shape only	7	6

Carbon electrodes, specially for medicated baths, &c., supplied to any size.

Monopole Rod, for use with the Hydro-Electric Baths Nos. 7180 and 7182. Finely plated and provided with two pegs to fit into sockets at each side of bath. Including two sockets ready to fix to the bath.

Order No.		
7212	.. ..	£1 10 0
7214	**Same,** for the porcelain baths. Instead of the two sockets, a clip or clamp arrangement will be supplied to suit the shape of the edge	1 10 0

Paddle Electrode, for use with Hydro-Electric Baths, consisting of a long wood handle with top about 4 in. × 8 in. on which is fixed a nicely rounded metal plate. Much used for applying the current up and down the spine or to any other part locally.

Order No.		s.	d.
7218	With connecting terminal	12	0

Commutator, or Current Director, to direct the various currents to the different electrodes fitted to the Baths Nos. 7136 to 7146, &c. Enabling any electrode to be switched positive or negative as desired, and permitting full body treatment or local treatment between any points.

With crank handles and studs mounted on polished wood board, exactly the same style as illustrated and described on page 116.

Order No.		
7230	With 5 cranks (4 for electrodes and 1 for monopole rod)	£2 0 0
7232	With 7 ,, (6 ,, ,, 1 ,, ,,)	2 7 6
7234	With 9 ,, (8 ,, ,, 1 ,, ,,)	2 15 0

The commutator can be mounted on any switchboard such as those on pages 40–44 if desired, the extra cost being only for the commutator itself.

Vibrators.

This Vibrator is the best and most compact instrument for general body vibratory massage at a moderate price. We have constructed a great number of vibrators of recent years but have never found one more simple or more efficient than this.

The Motor is of special design and construction, finely nickel-plated and finished and mounted on a nickel-plated base. It cannot be run off all different voltages and currents as is the case with our portable instrument (page 126) but must be constructed for a certain definite voltage and current.

It may be made to run from 12 volt accumulators or from any voltage continuous current main or alternating current main. Beneath the base of the motor is fitted a starting switch and rheostat for controlling its speed.

The Flexible Shaft is of latest improved pattern. It is exceptionally strong yet flexible. In years gone by the shaft often gave much trouble, but it is now brought to great perfection and never gives any trouble on any account.

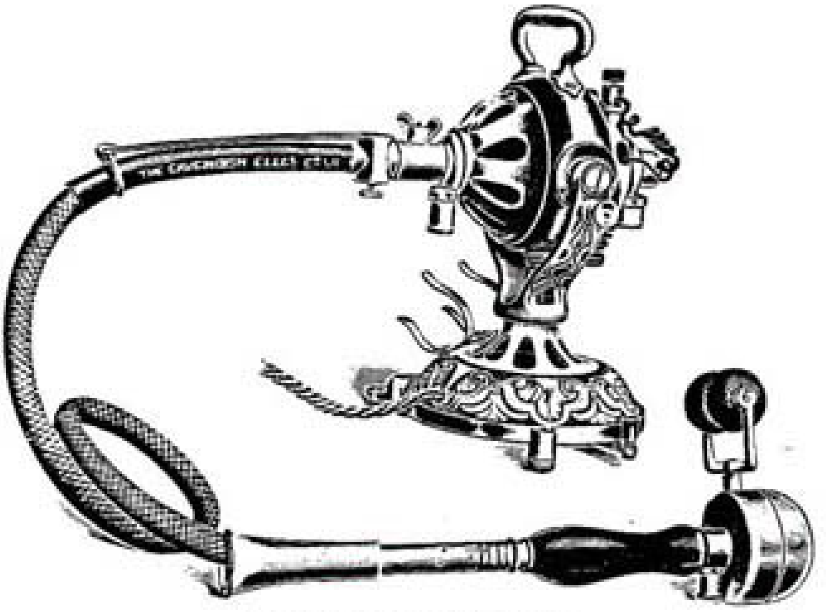
The Vibrator Hand-piece is shaped somewhat like a half sphere, is beautifully rounded off and nickel-plated so that it may be used for actual application to the body when desired. It is provided with a double rubber ball electrode allowing a rolling movement over the spine or any part of the body and actually, in our opinion, is the best all-round applicator made.

The strength or power of the vibrations can be exactly regulated. At the greatest strength the vibrator is decidedly strong and as such is suitable for body work over muscular parts of the body and over thick parts. The strength given is the maximum ever required in practical work. At the other extreme the vibration is so weak as to be hardly perceptible and as such can be used for treatment of the face or other sensitive parts. Between these two extremes any intermediate strength is obtainable and the regulations are carried out in the most simple manner merely by unscrewing the top of the hand-piece and altering the position of the eccentric revolving weight inside.

By varying the speed of the motor by means of the rheostat referred to above, the rapidity of the vibrations is controlled quite over and above the adjustment of the strength, although, of course, to some extent the speed of the motor naturally affects the degree of strength.

From this description it will be gathered that the instrument allows of any form of massage being carried out in a most simple manner. All possible conditions are complied with. In itself the instrument is well and strongly made, exceedingly simple and not on any account liable to get out of order or give any trouble whatsoever. In use it may be placed on any table or chair. It is quite portable, is very light and compact and provided with a handle for carrying. It is highly finished in every detail, and altogether the neatest and most convenient vibrator ever designed, capable of doing really efficient work of all classes.

Vibrators.



For Continuous Current.

Order No.				
7260	With Motor for 12 volts (Accumulator) to 65 volts	£9	0	0
7262	With Motor for 65 volts up to 120 volts	9	10	0
7264	With Motor for 120 volts up to 250 volts	10	0	0

For Alternating Current.

7270	With Motor for any voltage, alternating current	11	0	0

When ordering please state if continuous current or alternating current and the voltage. If alternating current, state also the periodicity as well as the voltage.

The quantity of current required by the motor is just the same as an ordinary 16 c.p. electric lamp, so that the cost of running the instrument is negligible, while moreover it follows that the Vibrator can always be worked from any ordinary electric lamp already existing.

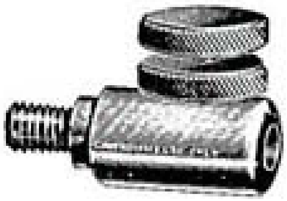
The coiled steel inner spindle of the flexible shaft and the steel spindle inside the vibrator handpiece carrying the revolving weight are made in one continuous length, so that the handpiece is not removable from the shaft. When required for working surgical drills or other instruments, then the handpiece can be made removable, as per Order Nos. 7350 and 7360. If so ordered the price of the above outfits increase **5s.**

Order No.				
7280	**Accumulator** for working the above Vibrator, 6 cell 12 volt, best quality, with sealed celluloid cells, contained in polished wood case with handles. Capacity 60 ampere hours	£6	0	0

Vibrators.

Any of the electrodes listed in adjoining pages can be made to screw into the handpiece after unscrewing the double ball electrode. Electrodes for special parts can be supplied to any shape and in either metal, ebonite, rubber, hardwood or other material as may be desired.

Electrode Fitting.



In order to avoid the continual screwing in and out of the electrodes whereby the screw threads are likely to become worn, it is recommended that the electrode fitting illustrated above be taken. This can be screwed into the handpiece and left, the various electrodes simply sliding into this fitting and being held there by a binding screw with a lock ring. The fitting must of course be removed when desiring to use the double rubber ball electrode, but otherwise it is particularly useful and convenient for all smaller applicators.

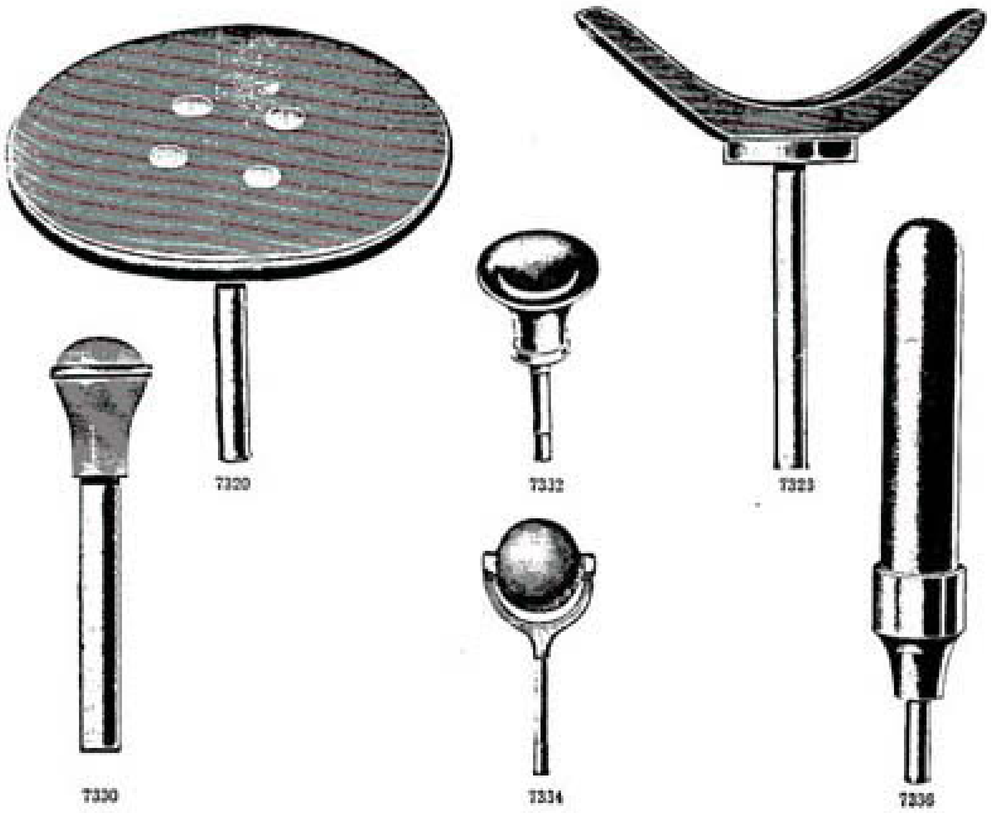
Order No.		s.	d.
7290	Nickel-plated	6	6
7292	Knuckle-joint fitting, same idea as above but with two parts instead of one, the two being hinged like a knee-joint, thus permitting the electrodes being used at any angle up to a right angle. With binding screw and lock-ring to fix the joint at desired angle, and binding screw and lock-ring to fix the electrode	12	6

Vibrator Motors.

These motors are exactly the same as illustrated and described on preceding page. Besides working the vibrator the motors can be used for driving the ear pump (No. 7450), fan (No. 7420), centrifuge (No. 7490), Leduc interrupter (No. 7430), etc., the fitting of all instruments being universal.

Order No.		£	s.	d.
7800	For continuous current from 12—65 volts	£4	15	0
7802	For continuous current from 65—120 volts	5	5	0
7804	For continuous current from 120—250 volts	5	15	0
7810	For any alternating current main	6	15	0

Vibrator Electrodes.



To fit the Adapter No. 7290-2.

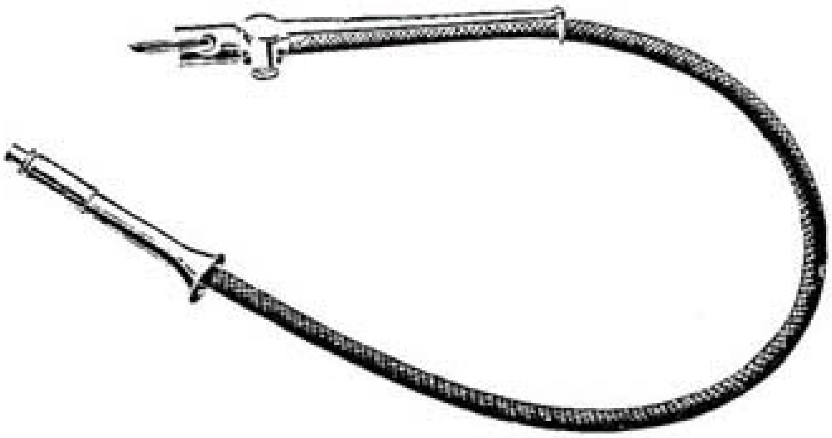
Order No.		Price s.	d.
7320	Round ebonite plate, 3 in. diam., for stomach, back, &c.... ...	6	6
7322	Same, but smaller, 2 in. diam., for neck, sides, &c.	5	0
7324	Same, but smaller, 1 in. diam., for neck, limbs, &c.	3	6
7326	Ebonite, shaped for throat, wrist, limbs, &c.	6	0
7328	Same, but larger, about 5 in. × 2½ in., for stomach, hips, &c. ...	8	0
7330	Rubber tip, for round ears, eyes, nose, &c.	1	6
7332	Rubber cup, bell shaped mouth, in soft rubber, for face, neck, scalp and sensitive areas	6	0
7334	Solid rubber ball, for muscles, groin, &c.	7	0
7336	Rubber, flexible tip, 3½ in. long, for internal, &c.	6	0

Same Electrodes, but with threaded stem to screw direct into the vibrator handpiece, **1s.** extra. When ordering place "a" after Order Number.

Vibrator applicators can be made to any size and shape, and in either ebonite, hardwood, rubber, metal, &c. A number are made and stocked besides the more usual patterns listed.

Flexible Shaft.

For carrying the vibrators listed below, the handpieces for surgical drills, &c. (page 184) and other instruments.



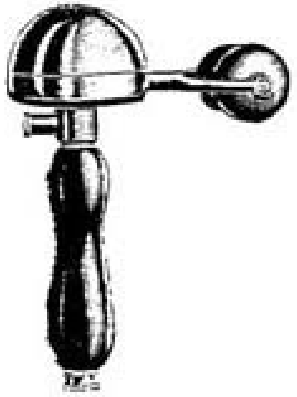
When these shafts were first made some years ago, they were very troublesome and always liable to breakage unless kept perfectly straight when in use. As the result of several years' experience, however, they have now been brought to perfection. The outer tube is of very strong coiled steel wire, strongly cotton braided outside. The internal spindle is of very strong and flexible 4-ply coiled steel wire. The two horizontal holders and all metal fittings are finely nickel-plated.

The whole shaft is very strong, but at the same time equally flexible. This will be fully realised when it is mentioned that the shaft can be coiled into a double loop, or like a figure 8, without breaking, and even in these unnatural positions will transmit the power from the motor perfectly. Obviously, however, the shaft should be kept as straight as possible when in use and given fair treatment, although capable of standing so much misuse.

One end of the shaft slides over the projection of our motors, such as pages 108, 109, 46, 122, 44, &c., being held in position there by the fly nut provided on each motor. The other end of the shaft is fitted with a spring catch for holding on the vibrator handpieces, the surgical handpieces or other instruments.

Order No. 7350 ... ... **£1 15 0**

Vibrator Handpieces.



Order No.
7360 **Vibrator Handpiece,** made to fit on above shaft by spring clip. Finely rounded and plated metal top on black polished wood handle, with oil cup. With double-ball electrode of solid rubber, made to screw in and out. The dome top is made to unscrew and perfect regulation of the strength of the vibration is effected by merely altering the position of the eccentric revolving weight inside. Very powerful and particularly neat and handy **£2 10 0**

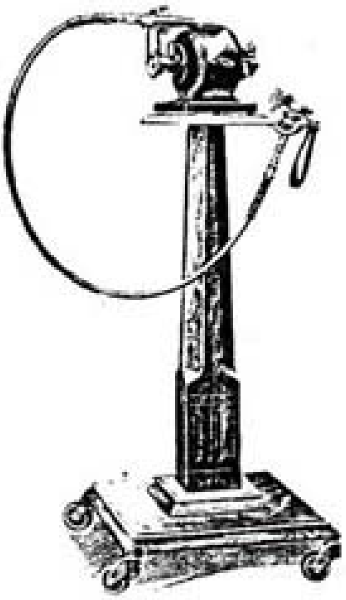
For further description see pages 120, 121. For other electrodes see pages 122, 123.

Order No.
7365 **Ball Vibrator,** similar to above and fitting to shaft in same manner. With ball-shaped top, instead of half sphere as illustrated. The feature of this handpiece is that the regulation of the strength is effected by merely turning the handle, which movement alters the position of the eccentric revolving weight, so that it can be done while working. Without electrodes: It carries the fitting (No.7290 2) and thus the electrodes, page 123.

Finely plated **£3 10 0**

Pedestal Vibrator.

The great feature of this vibrator is that a very strong vibration can be obtained without any vibration whatever to the operator's hand holding the handle of the handpiece. The vibration is hardly of the deep penetrating power of the vibrator described on page 120, but is very rapid, and is plenty strong enough for all general body massage. The handpiece is extremely small and light. There is no eccentric revolving weight inside the handpiece, but a special eccentric movement is provided which sets up a combined kneading and vibrating movement.



The motor is mounted on a highly-polished oakwood pedestal provided with rubber tyred castors, and moreover it is mounted on the top of the pedestal on a swivel, and so revolves according to the movements of the operator. The Flexible Shaft is very light and flexible, and yet of great strength. The power of the motor is transmitted to the vibrator handpiece by means of a coiled steel inner spindle. The actual transmission is by means of a little leather band running over pulley wheels. Three different sized pulleys are provided, so that three different ratios of speed are possible. This method has the advantage that great rapidity of vibration can be obtained. without necessitating a high speed motor with consequent greater wear and tear. Another advantage is that should anything happen to the vibrator or flexible shaft the motor is not suddenly pulled up, with risk of injury, for the simple reason that the motor will continue to run and the little driving band will merely slip.

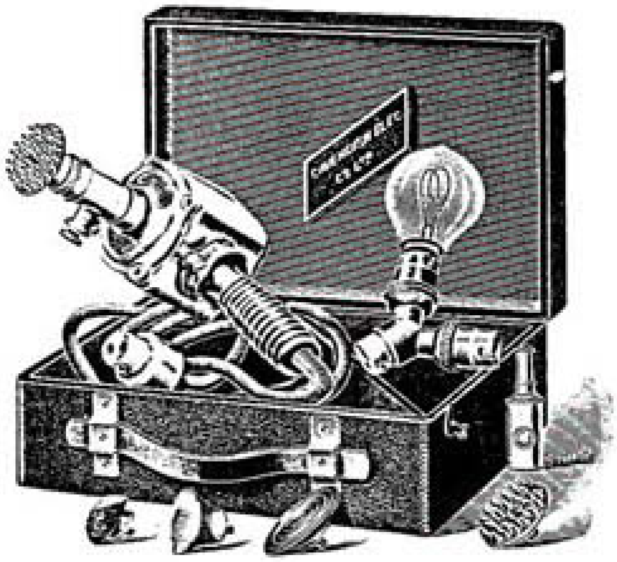
The motor is of best design and construction. The handpiece is particularly neat and light, and the handle which the operator holds is free to revolve, thus permitting the handpiece and shaft always to assume easy and natural angles. As remarked above, there is no vibration in the handle held by the operator, a feature only to be found in this instrument.

Complete with Set of Seven Electrodes.

Order No.		
7370	For any voltage continuous current, which please state when ordering	£13 0 0
7374	For any voltage alternating current. Please state voltage and periodicity when ordering	13 0 0

The instrument can be connected to the main by an ordinary two-pin plug or by a lamp adaptor into an ordinary lamp holder. The current consumed is the same as one ordinary lamp, so that it may be worked anywhere where electric light is installed, and the cost of the current is negligible.

Universal Portable Vibrator.



This Vibrator has been specially constructed to work on either alternating or continuous current at any voltage. Many experiments had to be carried out in order to arrive at a solution of this problem, but eventually it was accomplished, and no other accessory or extra appliances are rendered necessary than just a simple series lamp fitting. The motor is of great power in comparison to its small size and light weight, and does not slow down in speed as soon as a slight pressure is applied on the electrode, as occurs with similar vibrators endeavouring to imitate this, but of inferior make.

The motor is contained in a light case of metal with a metal handle, provided with a switch for starting and stopping. With this instrument there is no eccentric revolving weight, or anything of that nature; but an ingenious eccentric movement is provided in the prolongation of the axle where the electrode is attached. This arrangement enables a very rapid and powerful vibration being obtained, with the further advantage that a semi-circular movement is also imparted to the electrode.

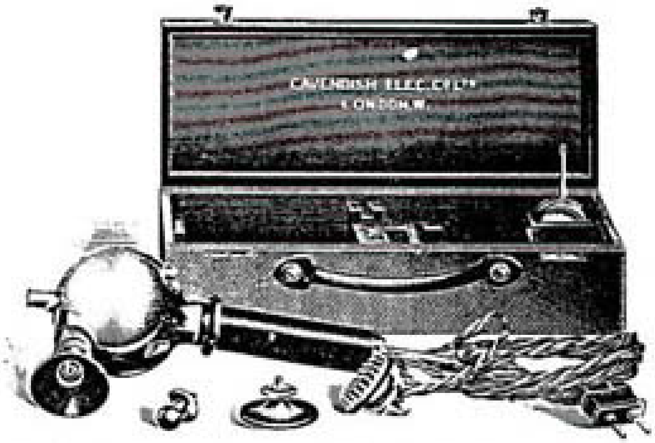
Five different electrodes are included with the instrument, these being made to screw in and out. The vibration is sufficiently strong for general body massage, and a brake arrangement is provided whereby the rapidity and strength can be controlled.

On **100 volts to 120 volts** the instrument only needs to be connected to the main by means of a simple 2-pin plug into a wall socket, or by means of a lamp adapter into any ordinary electric lampholder. The current consumed is about the same as one ordinary electric lamp, and is, therefore, quite negligible. By using the series lamp fitting supplied, the instrument can be worked off any current between **200 and 250 volts**, so that it may be worked off any main current either continuous or alternating, and any voltage between 100–250. It is, therefore, "Universal," and in this respect is absolutely by itself. For the same reason it is particularly suitable for taking about, since it can be worked anywhere, and is set up in a neat leather-covered case, with handle for convenience in carrying.

Order No.		
7380	Complete with a long length of stout flexible wire for connecting to main, with series lamp fitting and lamp, with 5 different applicators and oil can. Contained in neat case...	£5 5 0

Portable Vibrator.

Cheap Type.



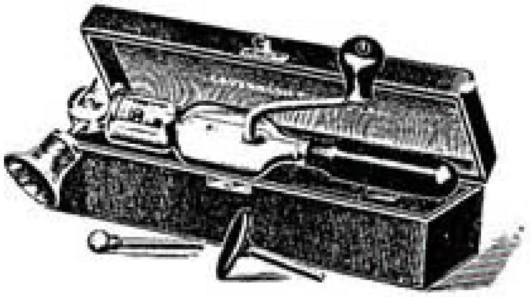
This is the cheapest vibrator driven by electro-motor that is manufactured. The motor is contained in a ball-shaped case of aluminium, provided with a polished wood handle. There is no revolving weight or any such mechanism to create the vibration, but the motor axle is made to work in an eccentric groove to create the same. It is an exceptionally neat and light instrument, and although not capable of heavy general body work it can nevertheless be used for body massage in many cases, although of course not comparing with the vibrator (page 121) for general body work. It is, however, particularly convenient for massage of the face, scalp, neck, and other sensitive parts, for which work it provides a very agreeable and rapid vibration.

In use the instrument has only to be connected to the main by means of a simple two-pin plug into a wall socket, or by means of a lamp adapter into an ordinary electric lamp holder. The current consumed is just the same as one ordinary lamp, so that it may be worked anywhere where electric light is installed, and the current consumption is quite negligible.

The instrument is set up complete in a very neat leather-covered case, with 4 different applicators, and with a length of flexible cable with plug.

Order No.				
7390	For any voltage continuous current, which please state when ordering	£3	10	0
7394	For any voltage alternating current. Please state voltage and periodicity when ordering...	3	10	0
7398	If desiring to work above vibrator made for 100 volts to 120 volts continuous current off 200 to 250 volts continuous current, this can be accomplished by the addition of a series lamp fitting. Price of series lamp fitting with lamp	0	5	0
7399	If desiring to work the vibrator off any main, either continuous or alternating current, at any voltage between 100-250, a special motor is supplied working in conjunction with a series lamp fitting. Price, including the series lamp fitting with lamp ...	4	0	0

Hand Driven Vibrator.



This is an exceedingly neat and efficient type of hand-driven vibrator. It has an advantage over earlier types in not having any exposed gear wheels, nor any revolving wheel, disc or weight at the top, which were always liable to fly off and do damage. They also made the application more difficult.

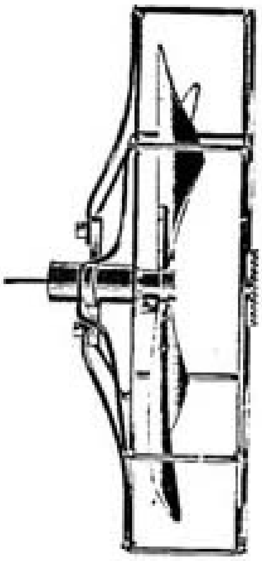
Our new instrument is much neater and lighter and altogether of better construction. By turning the milled ring at the top of the instrument, seven different degrees of strength can be obtained, this constituting a further important improvement over other makes, which offer no means of regulating the strength whatsoever. In this way the strength of the vibration can be exactly adjusted from weak to strong, and on "strong" the apparatus is capable of giving a vibration of ample strength for all general work.

The electrodes are carried in a clamp at the top, enabling them to be set at any desired angle, and in which they are firmly fixed by a fly nut closing the two halves of the clamp.

The whole finely made and finished. Black polished wood handle and all the remainder nickel plated.

Complete in leather covered, plush lined case with 3 electrodes, viz., a soft rubber cup, an ebonite disc and a rubber tip, similar to Nos. 7322, 7330 and 7332.

Order No.
7410 ... ... **£1 10 0**



Ventilation Fan. This fan is made to fit on to the motor of our Universal machines (pages 108/9), our motor-transformers (page 46), our motors (pages 122 and 44), &c.

It has a diameter of about 12 in. and gives a powerful draught of air. Fitted with guard. Best make and finely plated and finished.

Order No
7420 ... ... **£1 5 0**

Intermittent Galvanic Current by Prof. Leduc.

The intermittent galvanic current of Prof. Leduc is understood to mean an ordinary low tension galvanic current interrupted at the rapidity of about 100 interruptions per second, and with a contact period or time during which the current actually flows of one-tenth of a period; that is to say, one-tenth part contact period, and nine-tenths interruption period, or, in other words, contact period of one-thousandth of a second. It has been stated many times over that if the current be gradually increased up to 3 or 4 milli-amperes that general anæsthesia can be produced, the arrangement being said to be a large positive electrode on the patient's back, and a small active electrode (negative) placed on the forehead.

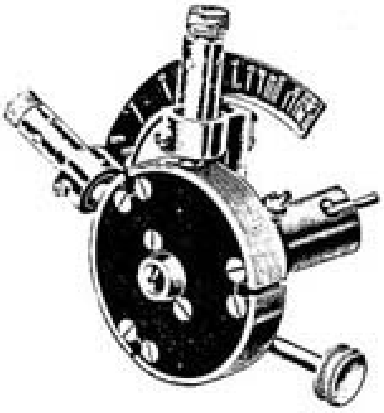
Local anæsthesia is said to be produced with about 2 milli-amperes, the two electrodes being placed just a little distance apart. We have ourselves always been able to produce this effect, but we have never known anyone who has ever produced general anæsthesia on the lines mentioned above.

Quite apart from this aspect, however, is the fact that an intermittent galvanic current is very useful for therapeutic and electro-diagnostic purposes. It possesses one great advantage over the Faradic or induced currents, in that it can be measured by a milli-amperemeter, and therefore accurately dosed.

The interrupting device itself is made to fit on to the motor of our Universal Apparatus (pages 108–9), our motor transformers (page 46), our vibrator motors (page 122), &c. The motor rotates the disc of the device, as seen in illustration. This disc is provided with three metal segments divided by insulating material. A galvanic current derived from our Universal machine (which at the same time is driving the interrupting device), or from any switchboard or battery, &c., is connected by one pole to one contact of the device, and from the other contact of the device to the patient. The other pole of the galvanic current is carried direct to the patient. The two slip contacts referred to can be placed close together or far apart, but they must never be placed further apart than the extreme limits of any one metal segment. When so placed the contact period is at the minimum, as no sooner do they both come on the one segment than one contact is passing off. If placed close together it follows that they will both pass along together over any one metal segment for a much longer time, and therefore the contact duration is at maximum. An engraved scale is fitted whereby the desired contact period can be adjusted in a most convenient manner.

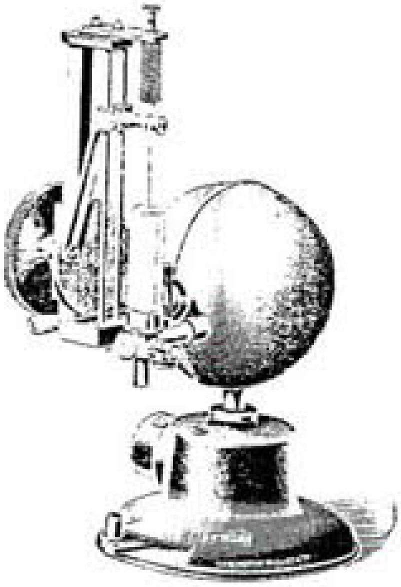
Intermittent Galvanic Current.

By Prof. LEDUC.



Order No.
7439 **Interrupting device** for obtaining intermittent galvanic current, consisting of an ebonite disc with three metal segments and with two adjustable contacts. Perfect control of the contact and interruption periods in relation to one another is effected by merely adjusting the distance of the two contacts from one another, as explained on previous page. The milled head screw fixes the contacts at the desired distance. The device is made to fit direct on to the motor of our Universal apparatus (pages 108-9), our motor transformers (page 46), our vibrator motors (page 122), or other similar motors, the necessary galvanic current being obtained from the Universal machine or from any switchboard or battery. Finely nickel-plated and finished £3 0 0

The rapidity of the interruptions can of course be controlled by varying the speed of the motor and the strength of the current interrupted is of course adjusted in the ordinary way by the apparatus from which it is obtained.



Rhythmic Interrupter, by Dr. Lewis Jones.

Galvanic, Faradic, or sinusoidal currents can be used in conjunction with this interrupter, the current being made to increase and decrease in slow rhythm at the rate of about one every four seconds. These slow impulses allow of complete contraction and relaxation between each stimulus, instead of the muscles being merely drawn up to a tetanic condition, as occurs with rapid stimuli from a rapid working interrupter, or from a Faradic coil, &c. Hence the advantages of slow working coils such as Nos. 153, 154, &c.

The device is geared to give these slow impulses, which may be controlled as to rapidity by varying the speed of the motor.

The instrument is made to work on the motor of our Universal machines (pages 108-9), our motor transformers (page 46), our vibrator motors (page 122), &c. In the case of the Universal machine the necessary galvanic and sinusoidal currents are derived from the machine itself, otherwise the currents must be obtained from a battery or switchboard, &c.; the strength of the current given to the patient is regulated by the apparatus it is derived from in the ordinary way.

Order No.
7440 ... ... £4 10 0

The glass vessel is adjustable to control the depth of the dip of the wire in the liquid.

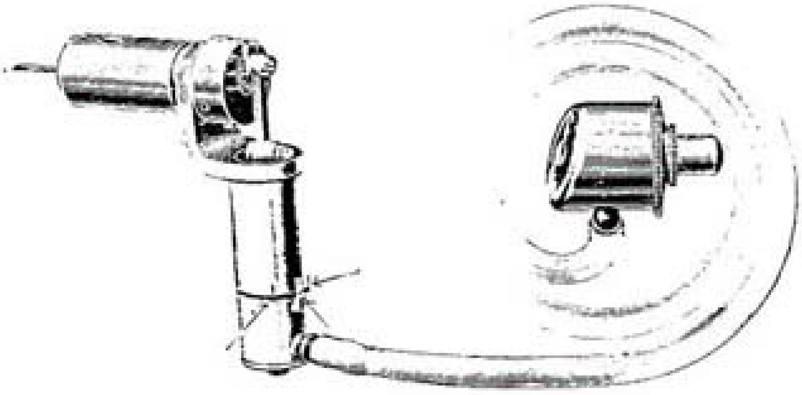
Pneumo Massage.

Air Pump for Massage of Tympanic Membrane.

This system of treatment is very generally adopted and has been most favourably reported upon. In the case of the one pattern the action constitutes a series of impulses of air which follow one another in rapid succession and are transmitted through the length of rubber tubing to the special vulcanite ear speculum. In the case of the more expensive pattern the opposite effect is obtained in addition, viz that of a suction, while still further a third effect is obtainable, viz: that of compression and suction alternately. These three effects are obtained merely by turning the lower portion of the pump cylinder.

The strength of the different effects in either pattern is accurately controlled by altering the stroke of the piston rod by means of the simple key provided.

These pumps are made to work with our Universal machines, pages 108 9, the motor transformers, page 46, or any of our motors such as pages 122, 44, &c. They may also be operated by a hand wheel or by a foot pedalling machine.



Order No.		
7450	**Air Pump for Tympanic Membrane**, finely plated and finished, with vulcanite ear speculum provided with a glass window. Complete with length of rubber tubing and key to regulate the strength	£2 0 0
7454	**Same**, but with three-way adjustment for providing compression, suction, and alternate suction and compression	2 10 0
7458	**Soft Rubber Cup Electrode**, exactly as No. 7332, but with hollow stem. Designed for gentle suctional massage of the face and other parts	0 6 0

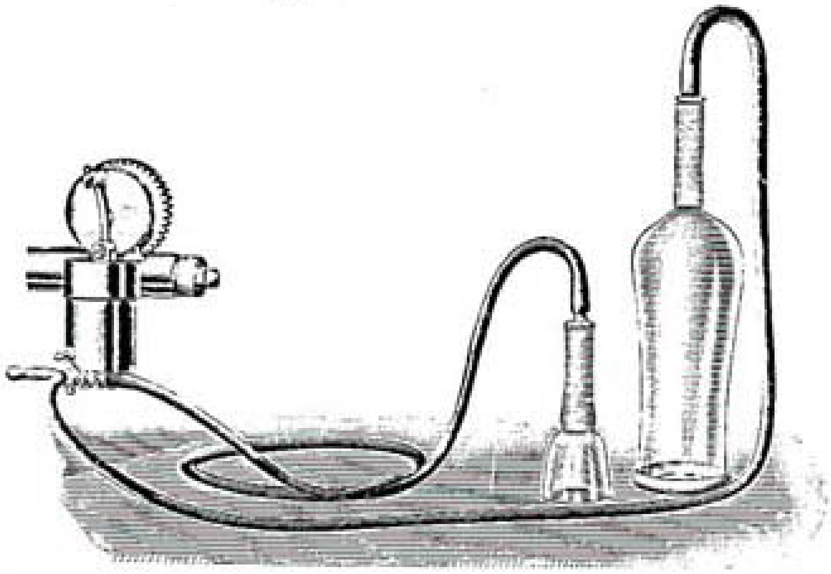
Pneumo Massage.

Air Pump for General Pneumo Massage.

This is a very powerful pump, made for pneumatic massage of the body. It is far too strong to be used for massage of the Tympanic Membrane, but otherwise the principle is exactly the same.

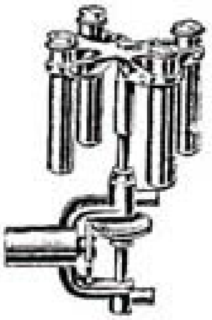
The pump is provided with a cog-wheel transmission so that the compression or suctional effects are slow and rhythmic. It is provided with three taps, one for blowing the air against the body or compression, one for the opposite effect, viz., a suction, and the third for alternate compression and suction, this latter providing a most excellent form of kneading massage of the body. The effect is so great that it appears exactly as if someone had gently but firmly seized hold of the flesh and was pulling it upwards and pressing it back alternately. In order that air may pass back into the vacuum of the suction glass, after having been drawn out, a special two-way tap with valve is introduced in the rubber tube, the same not being shown in illustration. This allows of cessation of the suction instantly.

The pump is made to work from our Universal machines, pages 108 and 109, and from the larger motors, page 44. Also off the motor transformers, page 46, but not off vibrator motors, page 122.



Order No.				
7470	**Air Pump,** finely nickel-plated and finished. With geared transmission, with three taps on pump and special two-way tap with valve introduced in the rubber tubing. Complete with one large and one small suction glasses and rubber tubes, one yard long, of specially stout rubber and with connecting piece to attach to the glasses	£7	0	0
7472	Small suction glass, 1½ in. diameter, with rounded edges ...	0	2	0
7474	Large suction glass, 2¼ ins. diameter, 8 ins. long, with rounded edges	0	3	6

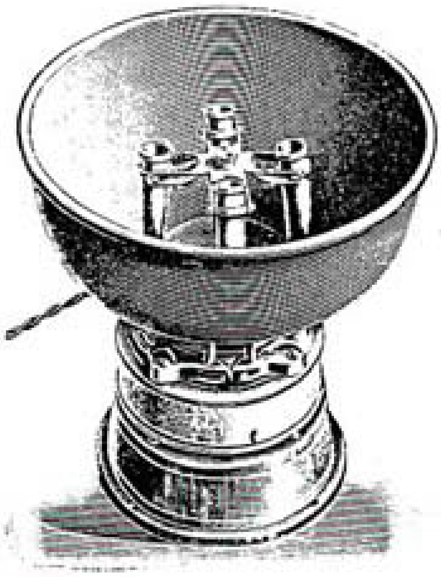
Centrifuges, &c.



Centrifuge with 4 tubes. Made to fit direct on the motor of the Universal apparatus (pages 108/9); the motor transformers (page 46); the motors (page 122), &c. A friction drive is provided with a strong spring device to ensure always a certain drive and to take up any wear on the leather contact disc. A special release clutch is fitted which enables the rotating tubes to come to rest gradually and without any jerk, after the motor itself has stopped.

The tubes are 4 inches long, ⅜ in. diameter. The whole finely plated and of best make and finish throughout.

Order No.		
7490	... ...	£3 0 0
7494	**Centrifuge as above,** but with protecting bowl with lid, finely nickel-plated	3 12 6



Centrifuge with motor in base. Fitted with release clutch as explained above, with 2 tubes and made to give 3,000 r.p.m.

Order No.		
7500	For direct current up to 120 volts	£4 5 0
7502	For direct current up to 250 volts	4 17 0
7504	For alternating current ...	5 15 0

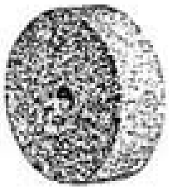
If with 4 tubes, prices increase 5/-

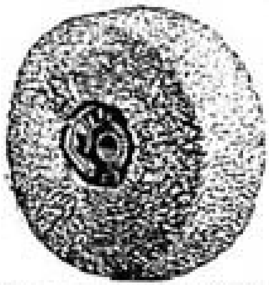
Bowl-shaped protector with lid, plated, 12/6.

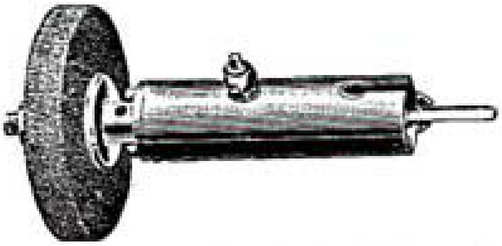
Centrifuge for Blood Testing, consisting of motor-centrifuge No. 7500, with large top mounted on a pillar, with large pulley wheel, giving 10,000 r.p.m., with 2 tubes.

Order No.		
7520	For direct current up to 120 volts	£5 5 0
7522	For direct current up to 250 volts	5 17 0
7524	For alternating current	6 15 0

If with 4 tubes, prices increase 5/-



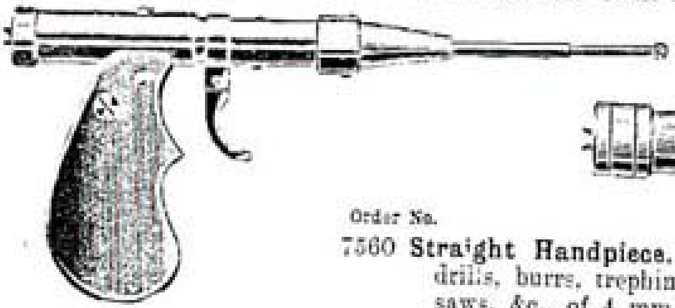


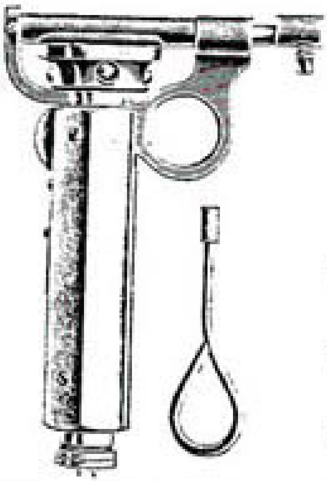


Order No.		
7540	**Fitting** to carry polishing buffs, emery wheel, &c. Made to fit direct on the motor of the Universal apparatus (pages 108/9); the motor transformers (page 46); the motors (page 122), &c. Finely plated, with washers and nuts for holding the buffs, &c.	£0 17 6
7542	**Emery Wheel,** fine, 3 in. diam. for sharpening instruments ...	0 7 0
7544	**Hard Felt Disc,** 2½ in. diameter, for polishing	0 2 0
7546	**Wool Mop,** 3½ in. diameter, for finishing polishing	0 3 0

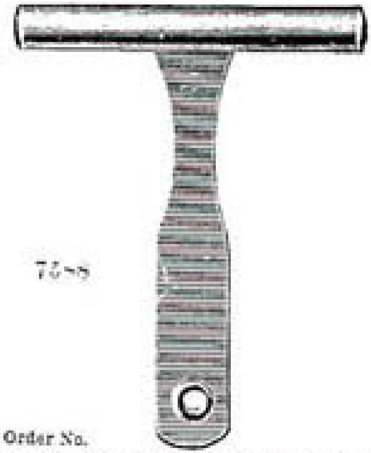
Surgical Instruments.

All Handpieces fit on Flexible Shaft No. 7350.

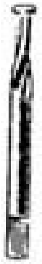




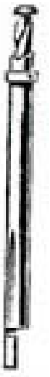
Order No.		£	s.	d.
7560	**Straight Handpiece**, sterilisable, for drills, burrs, trephines, and circular saws, &c., of 4 mm. diameter ...	£1	5	0
7562	**Same**, but for tools 5 mm. diameter stem	1	10	0
7564	**Handpiece, Pistol shape**, with trigger switch to stop tools instantly. To carry drills, burrs, trephines, and circular saws 4 mm. diameter stem...	2	16	0
7566	**Eccentric Handpiece**, to carry straight saws or chisels, giving longitudinal movement. With device to stop tools instantly	2	17	0
7568	**Adaptor**, for using tools 4 mm. in diameter in handpieces intended for 5 mm. tools	0	6	0
7570	**Adaptor**, for using tools 5 mm. in diameter in handpieces intended for 4 mm. tools	0	6	0
7572	**Key** for tightening tools in handpiece No. 7566	0	0	9



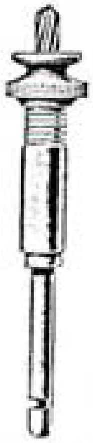
7588



7581



7587



7580

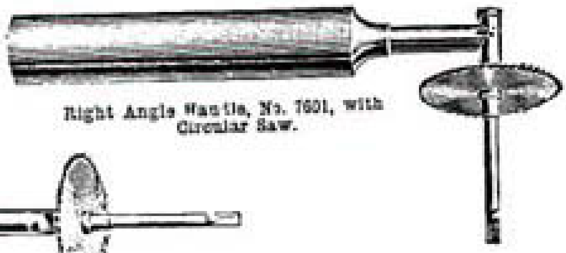
Trepanation set by Sudeck-Kümmel.

Order No.		£	s.	d.
7580	**Starting Drill** by Dr. Kümmel, adjustable as to depth (Fig.)	£0	17	0
7581	**Burr**, by Dr. Sudeck, with protecting head, to extend the circular hole sideways (Fig.)	0	4	0
7582	**Trephine**, 4 mm. diameter	0	3	3
7583	**Trephine**, 5 " "	0	3	3
7584	**Trephine**, with guiding drill 6 mm. diameter (after Fig No. 7081)	0	4	6
7585	**Trephine**, " " 7 " " " " "	0	4	6
7586	**Trephine**, " " 8 " " " " "	0	4	6
7587	**Burr** by Dr. Sudeck, with protecting head. Also made so as to work with a chest drill for hand-driving (Fig.)	0	4	0
7588	**Guiding Handle** for use in operations when working with hand drill (Fig.)	0	4	0

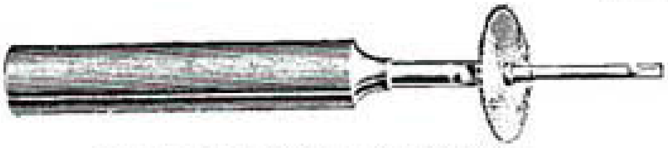
Surgical Instruments.

CIRCULAR SAWS.

For working with Handpieces, Nos. 7560-7564.



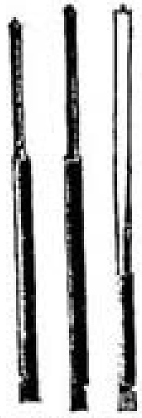
Right Angle Handle, No. 7601, with Circular Saw.



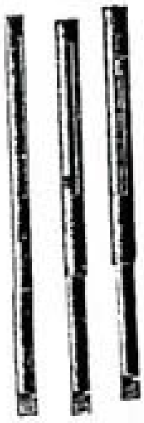
Straight Handle, No. 7600, with Circular Saw.

Order No.		s.	d.
7600	**Straight Handle** for guiding circular saws, with 2 keys to exchange same (Fig.)	17	0
7601	**Right Angle Handle** by Dr. Berndt, to guide circular saws (Fig.) ...	17	0
7602	**Circular Saw** of Finest Steel, 20 mm. diameter, fitting to Handpieces Nos. 7600 and 7601	4	9
7603	**Circular Saw** of Finest Steel, 30 mm. diameter, fitting to Handpieces Nos. 7600 and 7601	5	3
7604	**Hook Curette** to remove the drilled fragments out of the trephines ...	2	6

Instruments for Jaw and Middle Ear Operations.



Nos. 7624 7625 7628.



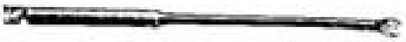
Nos. 7629 7630 7631.

Order No.		s.	d.
7620	**Lancet Shaped Drill.** 1 mm. wide	2	0
7621	**Lancet Shaped Drill.** 2 " "	2	0
7622	**Half Round Drill.** 1 mm. wide ...	2	3
7623	**Half Round Drill,** 2 " " ...	2	3
7624	**Half Round Drill,** 3 " " with hole in point (Fig.)	2	3
7625	**Half Round Drill** 4 mm. wide, with hole in point (Fig.) ...	2	6
7626	**Half Round Drill,** 6 mm. wide, with hole in point	2	6
7627	**Half Round Drill,** 8 mm. wide, with hole in point	2	9
7628	**Central Drill,** 4 mm. wide, with hole in point (Fig.)	2	9

Order No.		s.	d.
7629	**Trephine** of 4 mm. diameter (Fig.)	3	3
7630	**Trephine** of 5 " " (Fig.)	3	3
7631	**Trephine** of 6 " " with guiding drill (Fig.)...	4	6
7632	**Trephine** of 7 " " " "	4	6
7633	**Trephine** of 8 " " " "	4	6

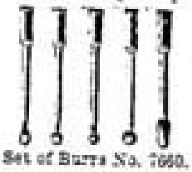
Surgical Instruments.

Burr No. 7656.

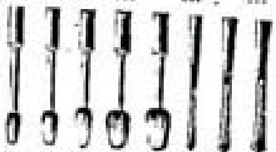


Ball Burr No. 7663.

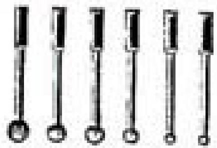
Order No.		£	s.	d.
7650	**Ball Burr.** 3 mm. head, 70 mm. long ...			
7651	**Ball Burr.** 3 „ „ 100 „ „	£0	2	9
7652	**Ball Burr.** 4 „ „ 70 „ „	0	3	0
7653	**Ball Burr.** 4 „ „ 100 „ „ (Fig.)	0	3	0
7654	**Ball Burr.** 5 „ „ 70 „ „	0	3	3
7655	**Ball Burr.** 5 „ „ 100 „ „	0	3	3
7656	**Burr** by Dr. Sonnenkalb, cylindrical, to enlarge hollows of bones and drilled channels (Fig.)	0	3	9
7657	**Trephine** by Dr. Spiess, to open sphenoid bone hollow	0	5	0
7658	**1 Set of Trephines** by Dr. Vohsen, consisting of 3 trephines with 2 guiding protectors opening upwards and downwards, to free the epitympanicus cavity and to open sphenoid hollow, &c.	0	13	6
		3	0	0



Set of Burrs No. 7660.

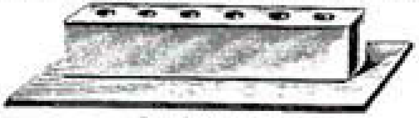


Set of Drills & Burrs No. 7661.



Set of Ball Burrs No. 7662.

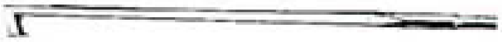
Order No.		£	s.	d.
7660	**1 Set of 5 Burrs** by Prof. Stacke, to open sphenoid hollow (Fig.)	£0	16	0
7661	**1 Set of 3 Drills and 5 Burrs** by Prof. Stacke, to open hollow of upper jaw (Fig.)	1	4	6
7662	**1 Set of 6 Ball Burrs** by Prof. Stacke, for the middle ear cavities (Fig.) ...	0	18	6
7663	**1 Flexible Trephine** by Dr. Suchanek, to open hollow of jaw towards nose ...	1	2	0



Stand No. 7664.

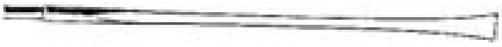
Order No.		£	s.	d.
7664	**Stand,** finely nickel-plated to take 6 drills, burrs or trephines (Fig.)	0	5	0
7665	**Stand** as above, but for 8 drills, burrs or trephines	0	6	0

INSTRUMENTS FOR RESECTION OF BONE ENLARGEMENTS OR PROJECTIONS IN THE NOSE.



No. 7673.

No. 7672.



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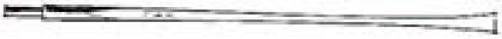
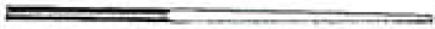


No. 7670.

Order No.		£	s.	d.
7670	**Straight Chisel** by Dr. Bresgen, 4 mm. wide (Fig.)	£0	3	3
7671	**Straight Chisel** by Dr. Bresgen with edge 6 mm. wide (Fig.)	0	3	3
7672	**Hook Chisel** by Dr. Bresgen with hook to the right (Fig.)	0	4	6
7673	**Hook Chisel** by Dr Bresgen with hook to the left (Fig.)	0	4	6



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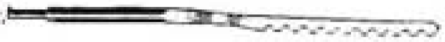

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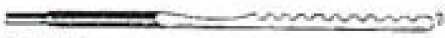
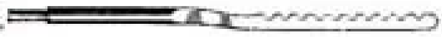
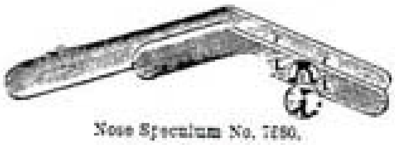


No. 7675.



No. 7678.

Order No.		£	s.	d.
7675	**Straight Saw** with teeth (Fig.)	£0	3	9
7676	**Straight Saw** wave shaped (Fig.)	0	2	3
7677	**Wave Shaped Saw** curved to the left (Fig.)	0	3	0
7678	**Wave Shaped Saw** curved to the right (Fig.)	0	3	0



Nose Speculum No. 7680.

Order No.		£	s.	d.
7679	**Nose Speculum** with one long and one short arm to introduce the instruments in operations of the nose. For the left side	0	7	0
7680	**Nose Speculum** as above, but for the right side (Fig.)...	0	7	0

Universal Orthopædic Apparatus.

For general orthopædic purposes, for the after treatment of fractures, sprains, and lameness resulting from accidents and all similar cases, two Universal movement appliances have been specially constructed by us on the valued suggestions of numerous medical friends. One appliance provides active exercises, and the other passive exercises. Our apparatus has been so designed, that any certain parts of the body can be subjected to the movements, merely by the selection of the necessary additional connecting pieces or adjustments, each of which is made to work with the one main machine, and each serving for the exercise of some special part or parts of the body. It is only necessary to change these adjustments in order to render the apparatus suitable for a different form of exercise, and thus one is enabled to utilise any desired form of exercise or movement in the most simple and convenient manner, without trouble or loss of time. Muscles, joints, or whole limbs, &c., can be treated quite independent of each other, exactly as required in each case. The Universal appliances are therefore exceedingly convenient and easily manipulated; they are efficient in a very high degree, and so beneficial are the results obtained that they will surely become generally adopted in the near future in every hospital, hydropathic, and similar establishment.

Compared with the previously cumbersome and expensive installations consisting of a great number of single appliances, our two Universal Apparatus naturally work out exceedingly cheap, while at the same time requiring but very little space, and yet being thoroughly efficient and of all-round utility. For these reasons they appeal equally to the Medical Practitioner.

"ACTIVE" UNIVERSAL ORTHOPÆDIC APPARATUS.

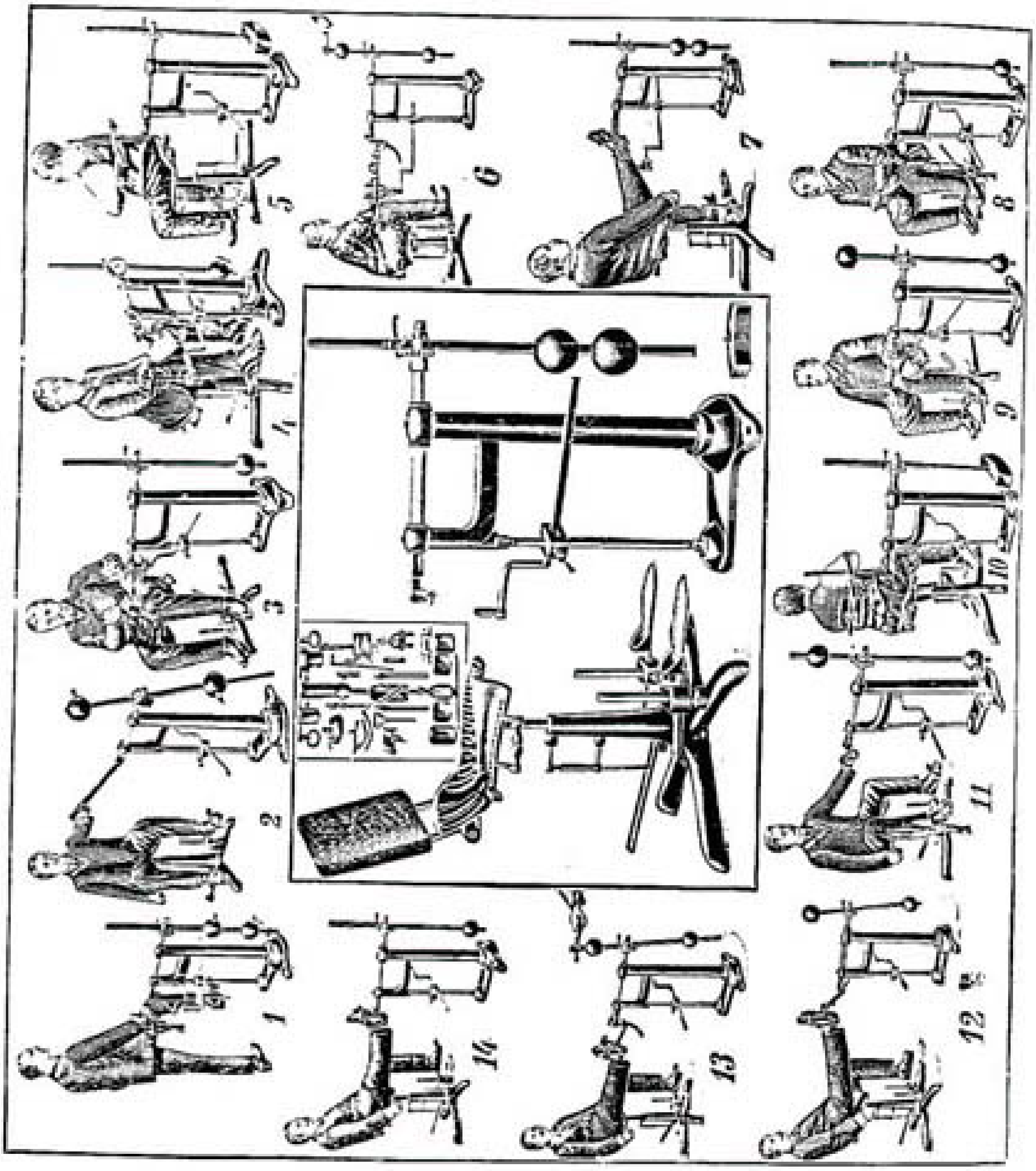
Construction.

The "Active" Universal Apparatus is composed of a strong base-plate with a vertical column rising from it about 34 ins. high, with a weighted pendulum swinging round the horizontal axle supported by the column. The weights fitted to the pendulum are specially made of different weight, with the object of dosing the power of the exercise. At the other end of the horizontal axle are attached the special connections or attachments designed for the different parts of the body. They are all very quickly and easily interchangeable, so that one can change instantly from one movement to another. The pendulum itself is not fixed immovable on to the horizontal axle, but can be turned round about it, and can be fixed to any position by means of a spring catch. By this means one can arrange that the pendulum—which by itself hangs always vertical—shall place the axle at any desired angle so that the attachments fitted to the other end of the axle shall stand straight or oblique as desired. Thus the movement of the exercise can be varied as required, according to the adjustment so that in one case, for instance, one could obtain a greater degree of upward bend and in another a greater degree of downward bend with each movement. It is therefore possible to exactly adjust the exercise to produce the requisite effect.

The various exercises possible are shown by the following pictures.

With each exercise the extent of resistance to be overcome can be exactly dosed so that one is enabled to commence with a small effect and to increase the same in gradual succession. For the treatment of patients following accidents and in fact for the whole orthopædic system, this is an absolutely important and essential factor.

"Active" Universal Orthopædic Apparatus.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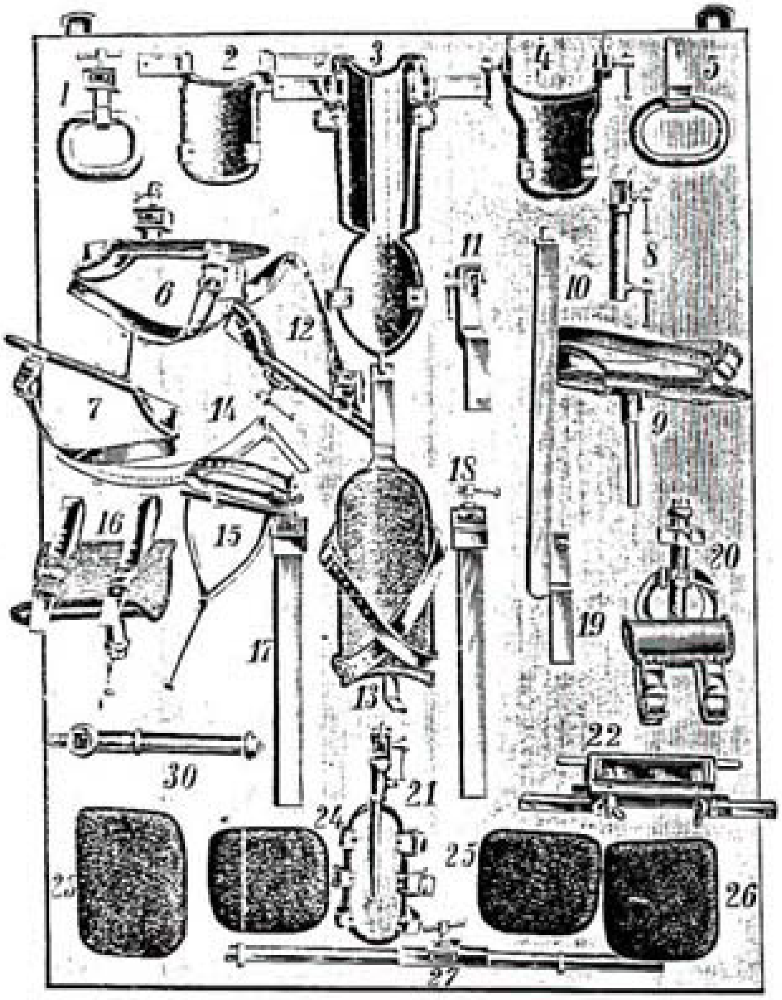
"Active" Universal Pendulum Apparatus (No. 7700) with a complete collection of all Attachments belonging to it (No. 7708) and with the Exercise Chair (No. 7802).

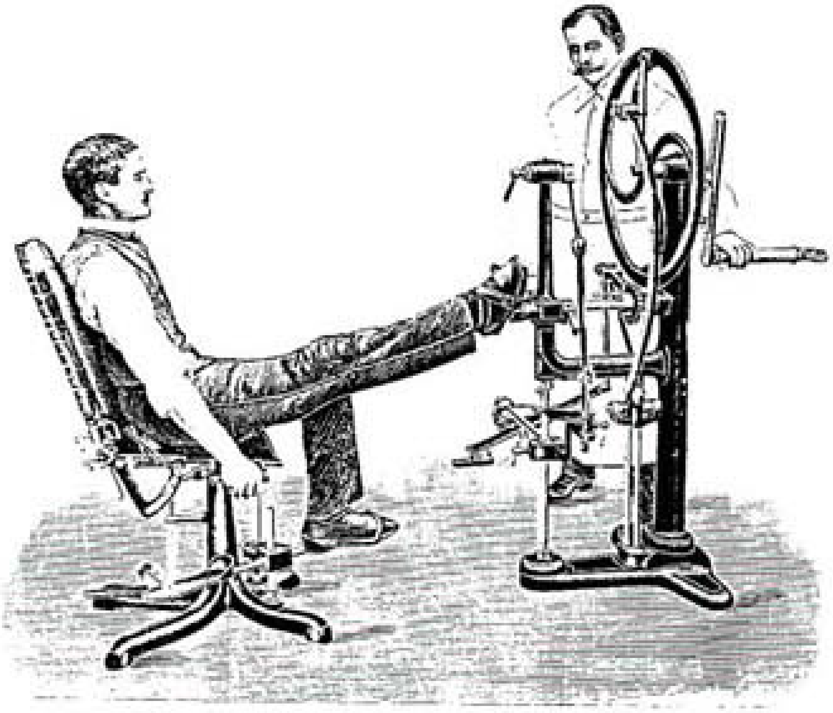


Complete Collection of Attachments for "Active" Pendulum Apparatus (No. 7708), mounted on Wooden Board (No. 7712).

Order No.				
7700	**"Active" Universal Orthopædic Apparatus** for general and special mechano-therapy. Finely enamelled with two adjustable ball weights, and with spring catch device to control the extent of the movement. As described previously. (Fig.)	£9	10	0
7704	**Heavy Pendulum Weight**, especially for the trunk exercises	0	13	0
7708	**Complete Collection of Attachments** for "Active" Apparatus, consisting of Nos. 1 to 27 and No. 30. (Fig.)	11	16	6
7712	**Wooden Board** on which to hang the attachments of the "Active" Apparatus. Nicely polished. (Fig.)	2	0	0

Order No.				
7720	Total price of complete "Active" Universal orthopædic apparatus ...	£23	19	6

"Passive" Universal Orthopædic Apparatus.

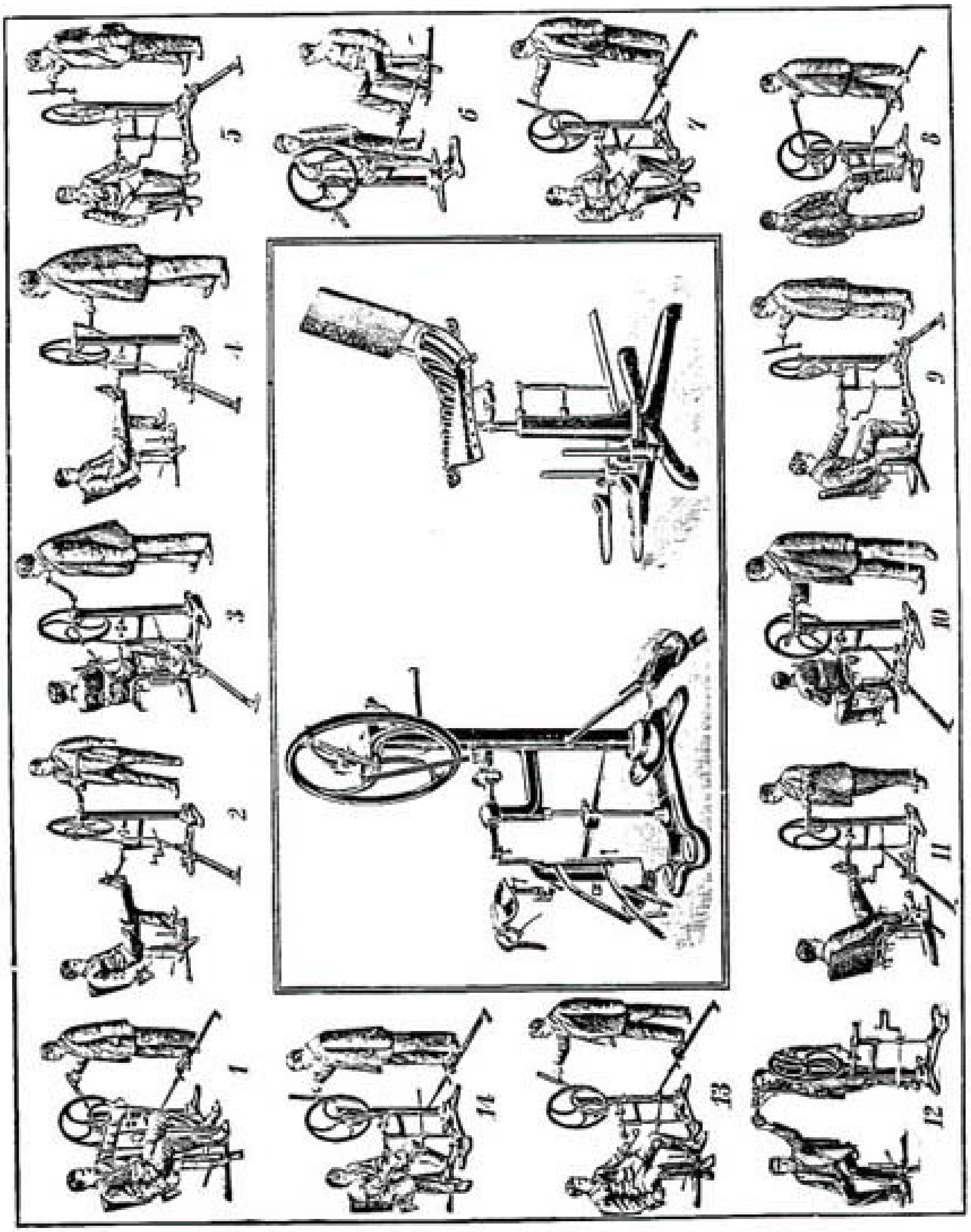


Latest Improved Model.

The new model introduces several important advantages, providing greater extent of movement and greater freedom, and thereby permitting more efficient carrying out of the various exercises. The improvements render the machine vastly more effective in every respect. The earlier model is to be seen on following page.

The "Passive" Universal Apparatus consists of a strong base plate, a stand with fly-wheel and frame work. The horizontal axle which carries the various attachments is set in operation by means of the fly-wheel, the axle being made to carry each of the different attachments, and thus enables all the desired exercises to be obtained. The interchanging of the attachments is effected exactly as in the case of the "Active" apparatus. The whole apparatus is very simple and convenient of manipulation, and does not demand any previous knowledge. Each exercise is separately shown by illustration so that one easily obtains a thorough idea of the apparatus. The driving axle to which the various attachments are fitted by means of a lever is so arranged that it is possible to adjust the starting position of the exercise as desired, permitting the increase or decrease of the length of way of the exercise at will. Thus it is possible to effect a greater extent of bending or of stretching, greater adduction or abduction, just as required, and can exactly adjust everything to provide any degree of exercise according to what the patient is able to stand.

"Passive" Universal Orthopædic Apparatus.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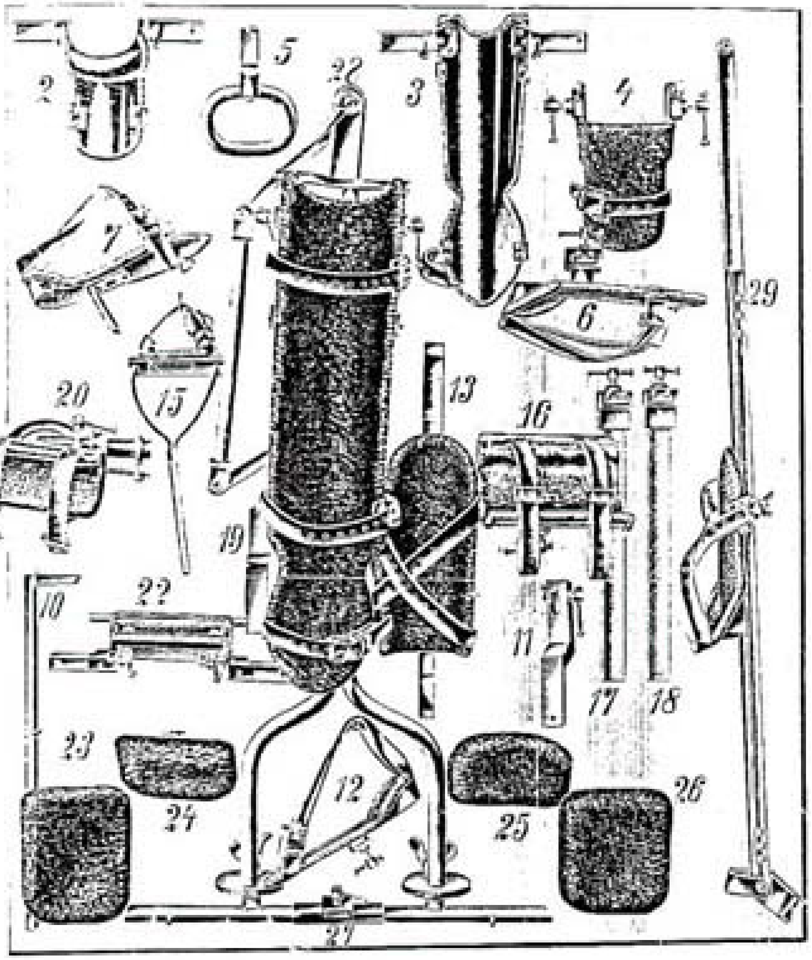
"Passive" Universal Movement Apparatus (No. 7740) with a complete collection of Attachments belonging to it (No. 7744) and with the Exercise Chair (No. 7802).



Complete Collection of Attachments for "Passive" Universal Exercise Apparatus (No. 7744), mounted on Wooden Board (No. 7748).

Order No.				
7740	**"Passive" Universal Orthopædic Apparatus** for general and special mechano-therapy. Finely enamelled, with adjustment for controlling the extent of the movement. As described previously. Without attachments, but including the adjustable handle, which at the same time serves as the handle for the shoulder rotation. (Fig.) ...	£20	10	0
7744	**Complete Collection of Attachments** for "Passive" apparatus, consisting of Nos. 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 22, 23, 24, 25, 26, 27, 28, 29. (Fig.)...	12	4	6
7748	**Wooden Board** on which to hang the attachments of the "Passive" apparatus. Nicely polished. (Fig.)	2	0	0
Order No. 7750	Total Price of complete "Passive" Universal Orthopædic Apparatus ...	£34	14	6

Separate prices for the attachments belonging to the "Active" and "Passive" Universal Orthopædic Appliances.

Order No.						
7760	Attachment	1.	Handle for rotating the arms. **(Exercise A III.)**	£0	6	0
7761	,,	2.	Plate for bending and stretching of wrist. **(Exercise A IV. and P IV.)**	0	10	0
7762	,,	3.	Splint for fixing the lower arm for bending and stretching of elbow joint. **(Exercise A VII. and P VII.)**	0	5	0
7763	,,	4.	Plate for sideway movement of wrist. Adduction and abduction. **(Exercise A VI. and P VI.)**	0	10	0
7764	,,	5.	Handle for turning of wrist. **(Exercise A I. and P I.)**	0	5	6
7765	,,	6.	Shoe with turning joint for rotating the leg. **(Exercise A X. and P X.)**	0	10	6
7766	,,	7.	Shoe with short fixed connecting bar. **(Exercise A VIII. and XI., and P VIII. and XI.)**	0	10	6
7767	,,	8.	Straight hollow intermediate piece with two screws for ankle rotation. **(Exercise A IX.)**	0	4	0
7768	,,	9.	Shoe with turning rod connection for ankle rotation. **(Exercise A IX.)**	0	10	0
7769	,,	10.	Long bar with short angle piece as intermediate piece for arm and leg rotation, and for bending of trunk sideways, forwards and backwards. **(Exercise A III., X., XIII. and XIV., and P X., XIII. and XIV.)**	0	4	0
7770	,,	11.	Short angled bar with screw as intermediate piece for bending and stretching of ankle. **(Exercise A XI. and P XI.)**	0	6	0
7771	,,	12.	Shoe for sliding on with slot, for bending and stretching of knee. **(Exercise A XII. and P XII.)**	0	9	0
7772	,,	13.	Splint for the lower leg for bending and stretching of knee. **(Exercise A XII. and P XII.)**	1	0	0
7773	,,	14.	Angle intermediate piece, graduated, for rotation of hand and ankle. **(Exercise A II. and IX.)**	0	9	0
7774	,,	15.	Upholstered support for hand and fingers for bending and stretching of hand and finger joints. **(Exercise A V. and P V.)**	0	7	0
7775	,,	16.	Upholstered support for the upper part of the leg, for bending and stretching of foot and knee joints. **(Exercise A XI. and XII., and P XI. and XII.)**	0	12	0
7776	,,	17.	Straight intermediate piece for bending of trunk sideways, forwards and backwards. **(Exercise A XIII. and XIV., and P XIII. and XIV.)**	0	5	6
7777	,,	18.	Same as No. 17.	0	5	6
7778	,,	19.	Short angle piece as intermediate piece for sideway movement of wrist. Adduction and abduction. **(Exercise A VI. and P VI.)**	0	5	6
7779	,,	20.	Upholstered support for lower arm for rotation of wrist, bending and stretching of hand and finger joints, and for sideway movement of wrist. **(Exercise A II., IV., V., VI., and P IV., V., VI.**	0	12	0
7780	,,	21.	Plate for rotation of wrist **(Exercise A II.)**	0	12	0
7781	,,	22.	Upholstered clamp (with rod) for bending and stretching of hand and finger joints. **(Exercise A V. and P V.)**	0	15	0
7782	,,	23.	Large upholstered plate for the back, for bending trunk forwards and backwards. **(Exercise A XIV. and P XIV.)**	0	5	6
7783	,,	24.	Small upholstered plate for bending the trunk sideways. **(Exercise A XIII. and P XIII.)**	0	5	6
7784	,,	25.	Same as No 24	0	5	6
7785	,,	26.	Same as No. 23, but for the chest	0	5	6
7786	,,	27.	Bar with screw as intermediate piece for bending of trunk sideways, forwards and backwards. **(Exercise A XIII. and XIV., and P XIII. and XIV.)**	0	5	6
7787	,,	28.	Upholstered splint for the whole arm, adjustable parallelogram and iron support to be mounted on the base plate of the "Passive" apparatus for raising and lowering of arm. **(Exercise P II.)**	1	10	0
7788	,,	29.	Shoe with lever for bending and stretching of hip joint. **(Exercise P IX.)**	1	4	0
7789	,,	30.	Driving crank for hand and ankle rotation. **(Exercise A II., IX.)**	0	5	0

N.B.—The attachment for arm and shoulder rotation Exercise (P III.) is fixed to the "Passive" apparatus.

The Exercise Chair.

The Special Exercise Chair we have designed is of great importance for the efficient carrying out of the exercises with our apparatus. This chair is of iron, finely enamelled. It is provided with an adjustable seat with upholstered back rest, and also two foot rests adjustable upward, downward and sideways.

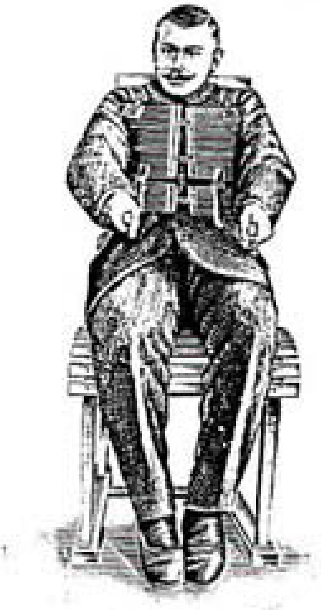
The seat can be adjusted as to height and the back rest quite independent of it, and be hinged backwards, and can be adjusted at will in a slanting or vertical position. In this way it is possible to give each patient not only the most convenient, but also the best and most efficient position according to circumstances.

PRICES:

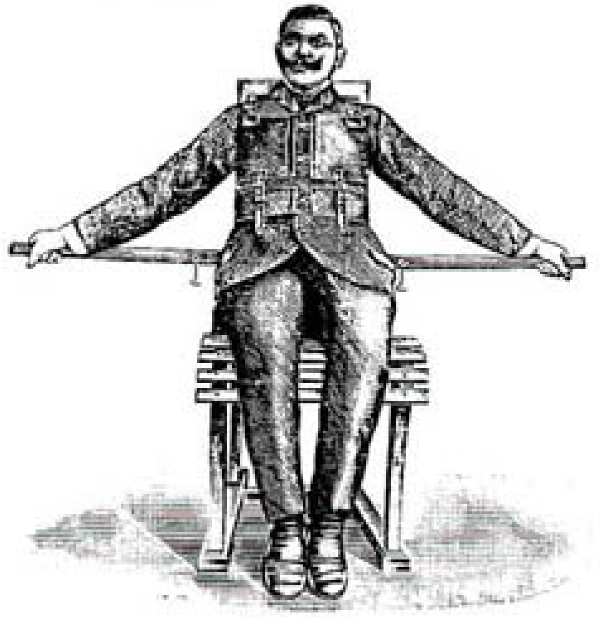
Exercise Chair for the "Active" or "Passive" Universal Orthopædic Apparatus. Of iron, finely enamelled with adjustable seat and with foot rests adjustable sideways.

Order No.		
7800	Without back rest	£4 14 0
7802	With back rest, which can be adjusted as desired in straight, slanting or backward positions. Illustrated page 140	6 10 0
	Exercise Chair, as above, but without foot rests.	
7804	Without back rest	3 16 0
7806	With adjustable back rest as above	5 12 0

Breathing Chair, by Prof. Rossbach.



Expiration.



Inspiration.

Breathing Chair by Prof. Rossbach, in wood. Of elegant appearance and well and strongly made and provided with back rest. With two adjustable moving arms and with pressure jacket. It can be adjusted to suit any stature.

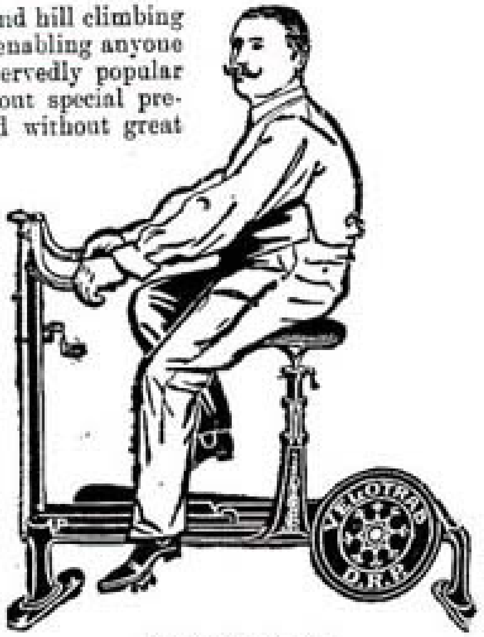
Order No.		
7820	(Fig.)	£3 15 0
7822	Cushion for the chair	1 7 6

"Velotrab" (Patent).

For Cycling Exercise, and for Cycling and Horse-trotting combined.

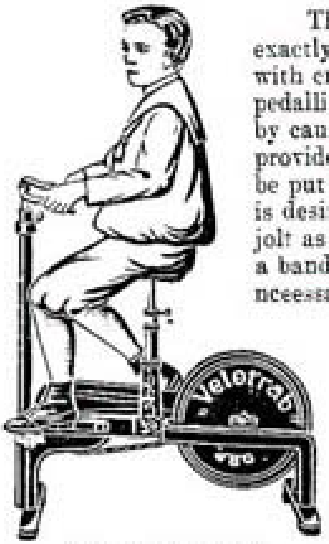
"**Velotrab**," a cycling, horse-trotting and hill climbing apparatus. A new and successful machine enabling anyone to enjoy the beneficial effects of those deservedly popular exercises—cycling and horse-trotting—without special preparation, without trouble, without risk and without great initial outlay and expense of upkeep.

From a strictly medical point of view the "Velotrab" offers the important advantage that the extent of the exercises is under perfect control, and can be adapted to the requirements of each individual case. As the exercise can be taken indoors the risks of the road and the weather are avoided, and nervous patients and others who have but little time to spare are thus enabled to take these popular and beneficial exercises, who otherwise would find it quite impossible to do so. The unexpected violent jolts due to unevenness of the roads are likewise absent.



"Velotrab." No. 7840.

Moreover, the exercise can be taken regularly, progressively and systematically, always a very essential factor in all Mechano-Therapeutic treatment. By progressively, we mean that the exercises can first be taken with very little exertion, and then as the user gains strength so the resistance to be overcome in the pedalling movement, and the violence of the trot can be gradually increased accordingly.



"Velotrab." No. 7842.

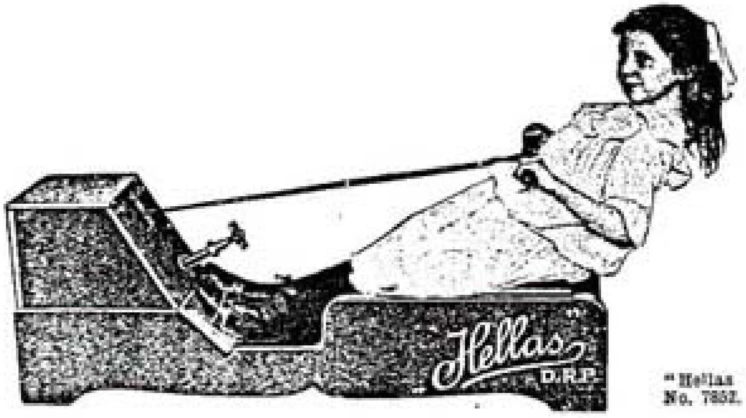
The cycling movement is accomplished in the same manner exactly as with an ordinary bicycle, the machine being fitted with cranks and pedals, chain wheel and chain as usual. This pedalling movement is arranged to produce the horse trotting by causing the saddle to jump up and down. The machine is provided with a handle for regulation of the trot, which can be put completely out of action when only the cycling exercise is desired, and then can be gradually increased to the extreme jolt as of a trotting horse. A handle is also provided, operating a band-brake, which permits a fine graduation of the strength necessary to drive the pedals, and thus the extent of the resistance to be overcome can be accurately adjusted to suit the strength of each individual user. Both regulations can be operated during the exercise. The saddle and handle bar are likewise adjustable.

The machine is very strongly constructed, and there are no parts whatever to wear or get out of order. The illustration shows the latest pattern, which is designed to stand firmly on any floor. It is provided with specially heavy feet, with rubber feet beneath, and stands firmly without requiring any fixing.

Order No.				
7840	(Fig.)	£10	0	0
7842	**Smaller model** for children. Fig.) ...	6	0	0

"Hellas" (Patent).

A NEW APPARATUS FOR ROWING EXERCISE.



"Hellas"
No. 7852.

The "**Hellas**" is a new apparatus for rowing exercise. After cycling and horse trotting there is no doubt that rowing ranks next as one of the most popular and beneficial of exercises. Practically the whole muscular system of the body is called in use, including certain sets of muscles which practically remain quite unused in our ordinary everyday existence. Moreover, the movement affects the whole of the organs of chest and abdomen. Almost every part, even including the wrists and ankles, is systematically exercised, and the extent of the exercise is under perfect control.

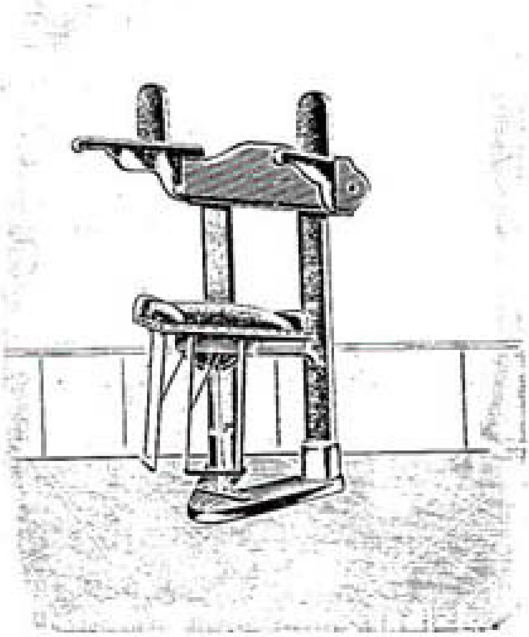
When working the machine, the exerciser pulls against a large spring, arranged like the mainspring of a clock. On relaxing his pull, the spring takes the user forward again on his sliding seat which runs on rubber-tyred wheels. A special band-brake is provided, so that by the simple turning of a handle the extent of resistance offered to the pull can be accurately regulated to suit all requirements, but the brake being fitted with a patent free-wheel arrangement does not exert an action against the spring after the pull is finished, and therefore the sliding seat is taken forward exactly as if the brake were not fitted. A particularly well designed and constructed machine, and a distinct improvement in several respects over previous types, and very much cheaper.

There is nothing to wear and nothing to get out of order in any way. It is constructed in polished wood with metal parts nicely enamelled and plated, and altogether is of excellent design and finish, and well and strongly made.

Order No.		
7850	... ...	£7 0 0
7852	**Smaller Model** for Children (Fig.) ...	5 0 0

The "Hellas" takes very little room when not in use, because it can be stood up vertically on one end.

Physical Exercise Apparatus.



Apparatus for Horizontal Turning and Twisting of Pelvis. In finely polished oakwood with seat upholstered in plush. The 2 supports intended to keep the shoulders straight are adjustable, inasmuch as they can be placed more forward or backward as required, and these, too, are covered with plush. Two handles are provided for the hands to grip, and 2 holders in which to place the feet.

The apparatus can be used by either ladies or gentlemen, and provides a very efficient exercise. The shoulders being held straight the whole movement takes place in the lower part of the trunk, and many muscles of the side and abdomen are called into play that are but rarely exercised in ordinary everyday life. (Fig.

Order No.		
7870	A most popular and useful apparatus	**£5 0 0**

A number of other physical exercise apparatus are manufactured, for pulling, rowing, hill climbing; for eccentric turning and twisting of trunk and abdomen; for vertical swinging movement of trunk and abdomen; for winding movements; for imitation of the movements as in sawing &c., illustrations and particulars of which will be sent on request to those specially interested.

We also supply the large and elaborate machines for exercise of special parts of the body, many motor driven, such as are in common use on the Continent. Illustrations and prices gladly submitted on receipt of definite requirements.

We undertake the complete installation for Hospitals, Hydropathies and similar institutions of every description of

Electro-Therapeutic, Hydro-Therapeutic & Mechano-Therapeutic Apparatus

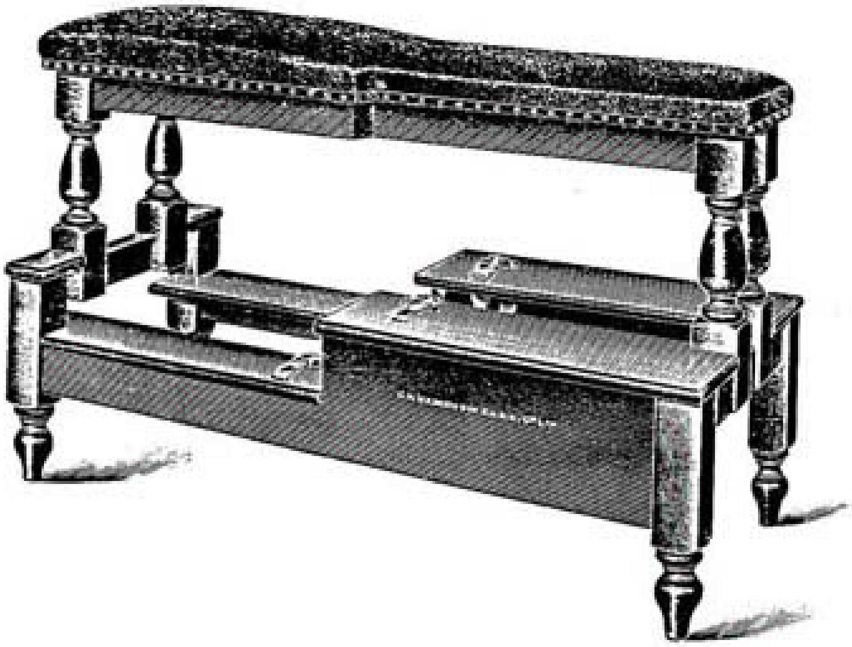
and allied and subsidiary apparatus of all kinds.

Swedish Exercise Apparatus.

Having a special cabinet making and joinery workshop, we are making a speciality of various apparatus for Swedish movements, an approved method of treatment much used in conjunction with electro-therapeutics.

The following illustrations of high and low plinths serve to indicate the high class of our goods. They are constructed by our own workpeople to the designs and measurements of a well-known Swedish operator. In every detail they are of the highest class.

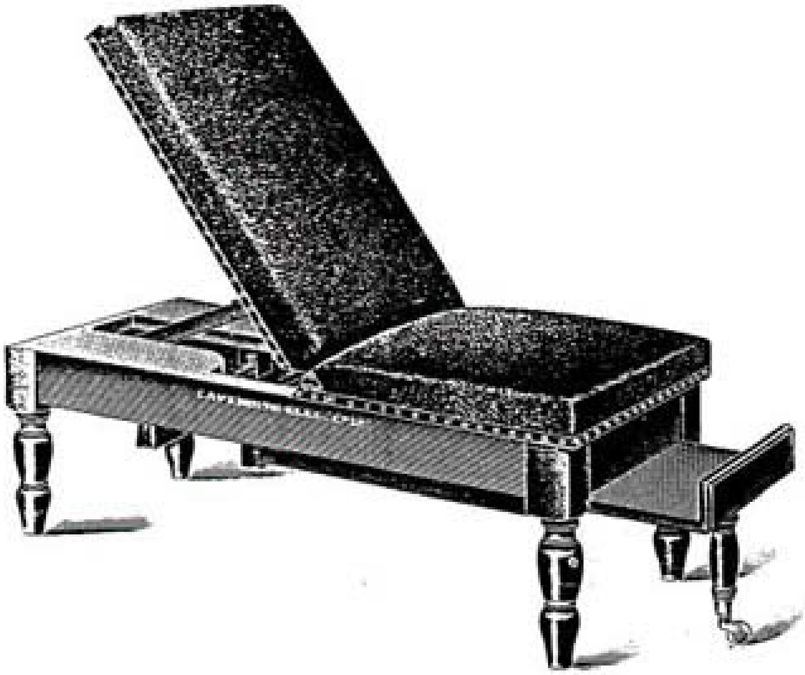
Every description of such appliances can be supplied, and we shall always be pleased to submit photographs or illustrations with best prices on receipt of requirements.



High Plinth, as illustrated above, of the very best make in every detail and highly finished. Well padded and covered with plush or with leather cloth. They are of very strong construction and elegant appearance.

Order No.		
7880	In good hardwood	£6 0 0
7881	In solid mahogany...	7 0 0
7882	In plain wood, cheaper finish	5 0 0

Swedish Exercise Apparatus.



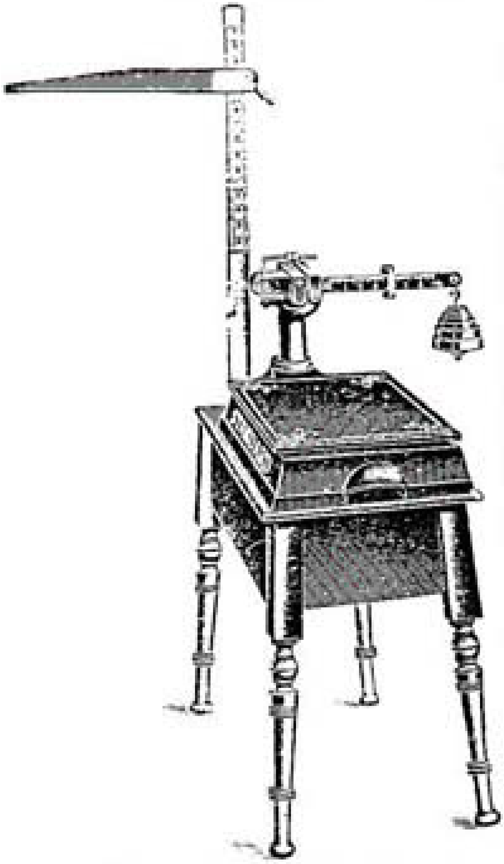
Low Plinth, as illustrated above, of very best make in every detail and highly finished. Well padded and covered with plush or with leather cloth. They are of very strong construction and elegant appearance.

Order No.			
7886	...	In good hardwood	£6 0 0
7887	...	In solid mahogany	7 0 0
7888	...	In plain wood, cheaper finish	5 0 0

When ordering either high or low Plinths, please state if plush covering or leather cloth be preferred, and colour, to which we will adhere as near as possible.

They can be constructed to special dimensions if required, or can be modified in any respect to comply with special requirements or conditions. Prices on receipt of specification.

Personal Weighing Machines.



"Standard" Weighing Machine.

For use in surgeries, private houses, &c.
To weigh 24 stone.

Cheap and light personal weighing machine, complete, with stained wood stand and height-measuring standard.

With platform 13½ in. by 10½ in., brass steelyard and slide, with balance-screw for easy adjustment. Ironwork neatly japanned.

With height-measuring standard graduated from 3 ft. to 6 ft. 6 in., and fitted with patent clip for locking the head-piece in position while reading the height.

Order No.				
7900	Weighing Machine only	£1	6	0
7902	Stained wood stand ...	1	3	0
7904	Height-measuring standard (to fit on to stand)	0	15	0
7910	Book specially ruled and indexed for recording the weights & heights	0	5	0

Weighing Machine with measuring standard, for consulting rooms, hospitals, gymnasia, &c.
To weigh 32 stone by single ounces.

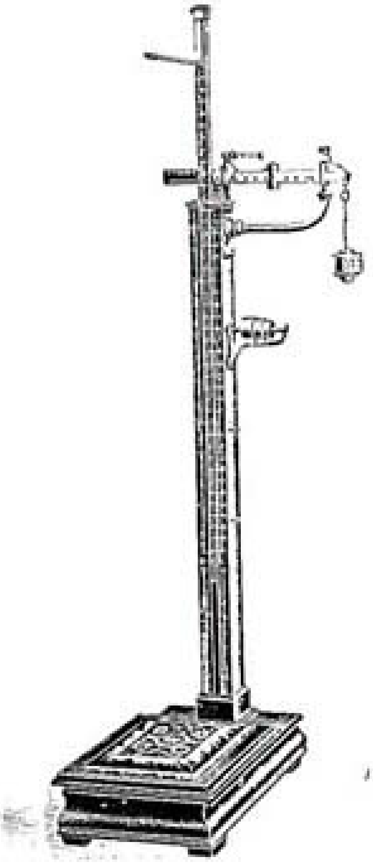
Handsome oak case, with nickel-plated brass mounts and platform upholstered with carpet. Nickel-plated brass steelyard, counter balance, and weights. Best hardened steel knife edges throughout.

Fitted with sliding standard for measuring height up to 7 ft.

Order No.				
7920	With boxwood standard ...	£11	6	0
7922	With nickel-plated ditto ...	11	18	0
7930	Similar type machine but simpler design. To weigh 24 stone by single ounces ...	3	15	0
7932	If with boxwood height-measuring standard graduated from 3 ft. to 6 ft. 6 in.	4	15	0
7940	Book specially ruled and indexed for recording the weights and heights ...	0	5	0

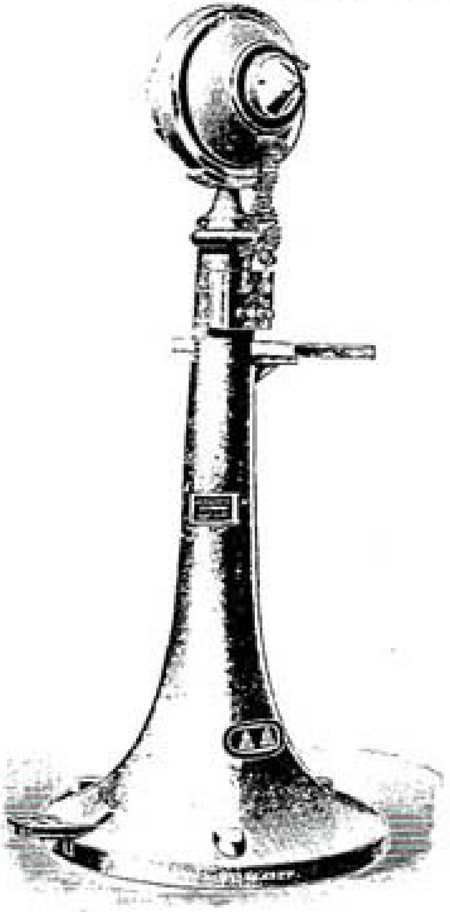
The above machines can also be made to weigh and measure in metric system, or in metric and English together, at slightly increased prices.

Illustrations and particulars of various arm-chair, automatic, and other patterns, and also height-measuring standards only, &c., will be furnished on request.



Electro-Magnets.

For removing Iron, etc., from the Eye.



Haab's Magnet.

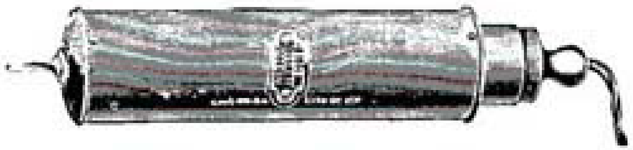
This is a large and very powerful magnet, consuming from the main 8 amperes at 200 volts, and capable of carrying over 600 lbs.

Mounted up on heavy floor stand as illustrated, on castors. With foot-switch for switching the current on and off. With shelf and with 3 different points to screw on.

Order No.
7960 ... ... £29 0 0

Large Electro-Magnet on telescopic floor stand on castors. With a long iron core suspended in a fork at top of stand and movable in any direction. It consumes 1 ampere at about 220 volts.

Order No.
7962 ... ... £11 11 0



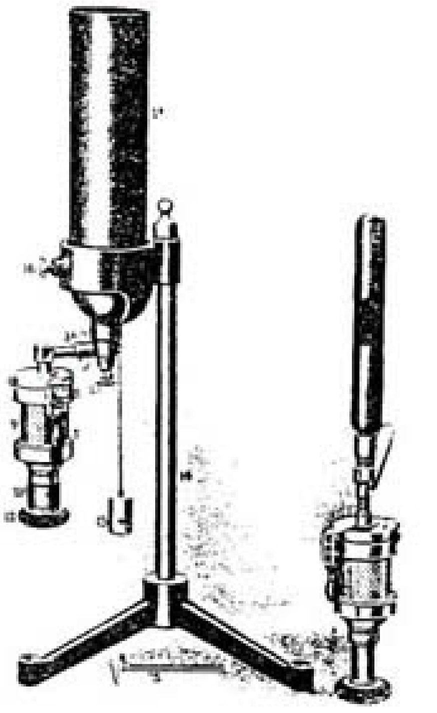
Order No.		
7964	**Large Electro-Magnet**, by Prof. Hirschberg, capable of carrying a weight of about 30 lbs. Made to work from 8 volts (accumulator) with a consumption of 7 amperes	£3 10 0
7966	**Same**, but wound for about 220 volts, with a consumption of a quarter of an ampere	4 4 0
7968	**Medium Electro-Magnet**, similar to above, wound for 8 volts (accumulator), with a consumption of 5 amperes	1 4 0
7970	**Same**, but wound for about 220 volts, with a consumption of 0.2 ampere	1 16 0
7972	**Small Electro-Magnet**, similar to above, wound for 8 volts (accumulator), with a consumption of 4 amperes and capable of carrying a weight of about 10 lbs.	1 0 0

All the above are provided with 5 different points.

Magnets can only be used with continuous current, not alternating current. State voltage when ordering.

Carbon Dioxide Snow Apparatus.

For producing the new Freezing Caustic—Solid CO_2.



Carbon dioxide snow has come into very general use although of comparatively recent introduction, and great success has resulted from its use in numerous cases.

It provides an effective treatment without cutting, burning, instruments, corrosive acids, or anæsthetics, for nævi lupus, lupus erythematosus, lupus vulgaris, warts, moles, and other blemishes demanding the attention of dermatologists.

The process is one of refrigeration, and is carried out by means of the local application of the solid carbon dioxide. Low temperature treatment was first attempted by the use of ethyl chloride spray, and liquid air has also been tried, but, owing to its liquid form, it is impossible to use the latter in an effective manner, as it is not only difficult of control, but incapable of being applied under pressure—a most important factor.

Carbon dioxide snow is solid, but yet sufficiently soft to be moulded or cut with an ordinary penknife to any convenient shape or size. It therefore enables as much pressure to be applied as desired, and thus freezes the tissues to any desired depth within a reasonable limit.

Carbon dioxide snow maintains a constant temperature, and when the tissues give up their heat to the solid CO_2 (temperature −79° C.) it becomes gaseous at −78° C., and escapes into the atmosphere, so that the surface in contact with the part under treatment is being constantly renewed.

The extreme degree of the cold enables this devitalising action to extend rapidly to the desired depth without allowing time for an injurious influence on the deeper or the adjacent parts, just as with heat applied by the cautery.

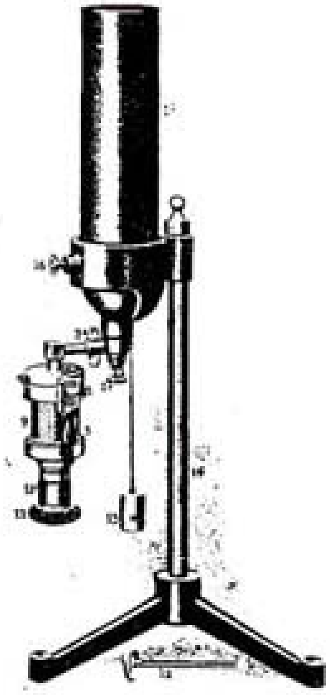
For shallow growths an average period of 40 seconds suffices for the required depth of destruction. Deeper structures, such as a thickly crusted wart, require a longer application.

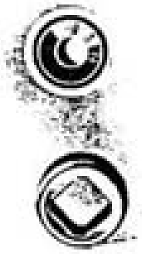
The anæsthetic effect of the cold renders other anæsthetics unnecessary. Adults undergo the treatment without trouble, and though there is some smarting which makes it necessary for timid children to be firmly held, the total absence of burning and cutting, with no sight of instruments or of blood, makes the operation so free from the circumstances of pain and danger, that even mothers of average fortitude can be useful assistants. No real pain is felt until the return of warmth to the parts. This is not too severe, and by that time the operation is over.

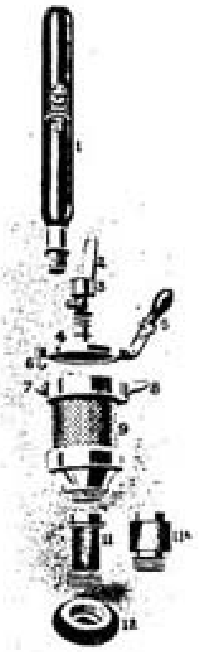
The Carbon Dioxide Snow Apparatus enables the general practitioner to produce the snow in a convenient, clean, quick and economical manner, and in the most suitable form for its easy and safe employment for various cases of minor surgery.

For a full description of this interesting method of treatment, the reader is referred to the paper read before the Electro-Therapeutical Section of the Royal Society of Medicine, by Dr. E. Reginald Morton, which appeared in the *Lancet*, December 4th, 1909. Excerpts from this article are included in a special booklet, wherein full working instructions are given.

The apparatus for producing the Carbon Dioxide Snow is made in two sizes, a larger one for use in hospitals, the surgery, etc., and the smaller one for easy conveyance in the physician's hand-bag, thus enabling the snow to be made and used at the patient's residence.







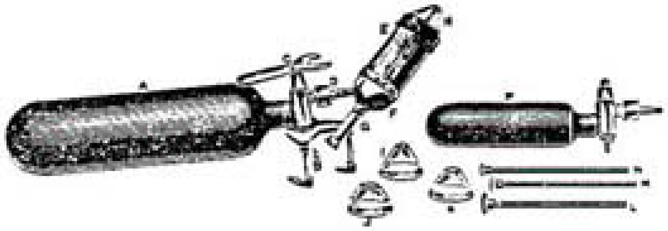
Prices.

Order No.		£	s.	d.
7980	**Hospital Apparatus**, complete with one cylinder, iron stand, one 1 in. square mould and spatula (Fig.)	£4	0	0
7981	**Portable Apparatus**, complete with one gaskette, one ½ in. round mould and spatula, in polished case	2	10	0
7982	Extra moulds, either 1 in. square, ½ in. square, or ½ in. round, to suit both patterns of apparatus	0	5	0
7983	Extra hospital cylinder, complete with valve, valve cap and nipple	0	15	0
7984	Extra gaskettes for the portable apparatus	0	6	0
	Full "Hospital" cylinders in exchange for empty	0	1	0
	Full gaskettes in exchange for empty	0	0	6

Empty cylinders and gaskettes must be returned carriage paid, and full ones will be sent carriage forward.

Carbon Dioxide Snow Apparatus.

For Making Solid CO_2 for Surgical Purposes.



The special points of this apparatus are:—Simplicity, portability, economy of gas, ease of manipulation and cheapness.

The method of use is as follows:—

Select a transparent cone (H I J K) with aperture of suitable size for part to be treated. Attach it securely to applicator (E) by the detachable collar.

Select a rod (L M N) with metal end of same size as aperture of cone.

Remove top of applicator (F G) and insert rod so that the metal end closes end of cone.

Replace top of applicator (F G), and fasten firmly by the bayonet catch.

Attach applicator to nozzle of cylinder in the position shown in illustration.

Release compressed CO_2 by turning key (C). First allow 3 or 4 very short rushes, then turn valve well on and let the CO_2 enter the applicator with considerable force for 5 seconds or more, according to amount of snow required. Then turn off the valve securely.

Remove applicator (E) from cylinder, hold same with end of transparent cone pressed firmly upon a table or other smooth surface, remove spring tube (G), ram down the snow firmly with the rod into apex of cone; replace spring tube (G) by pressing it down over end of rod.

(Do not remove the perforated dome—F.)

To operate, press the exposed surface of solid CO_2 against the part to be treated. The level of the exposed surface of CO_2 is automatically maintained by the spring pressing upon the rod.

When required, the spring tube (G) may be removed, and the pressure maintained by the thumb.

When a pencil of CO_2 is required attach one of the moulds (supplied separately) to applicator in place of a transparent cone, ram down the CO_2 snow into end of mould, then remove cap and push out the pencil.

Before returning the cylinders for refilling, remove Stand (B) and Nozzle (D).

For articles see "Lancet," Dec. [illegible] "British Medical Journal," Jan. 25, [illegible], &c., &c.

Carbon Dioxide Snow Apparatus.

Prices.

Order No.		
7985	**Standard outfit,** with one 2 lb. cylinder	£2 10 0
7986	**Portable outfit,** exactly as above but with small cylinder (P) ½ lb. size	2 5 0
	The two cylinders are interchangeable.	
7987	**Hospital outfit,** with one 10 lb. cylinder, slightly stronger built	3 12 6

Cylinders of Gas.

Portable cylinder, to hold ½ lb.	0 10 0
Standard cylinder, to hold 2 lbs.	0 15 0
Hospital cylinder, to hold 10 lbs.	1 15 0

Refilling Cylinders.

Refilling cylinders, ½ lb. and 2 lb. size	each	1 0
„ „ ½ lb. size, 6 at a time	„	0 9
„ „ 10 lb. size	„	3 0
Extra transparent cones	„	2 0
Special sizes made to order.		
Moulds for making Pencils	„	3 0

Carbonic Acid Water Baths.

Nauheim Baths for Treatment of Heart Disease, &c.

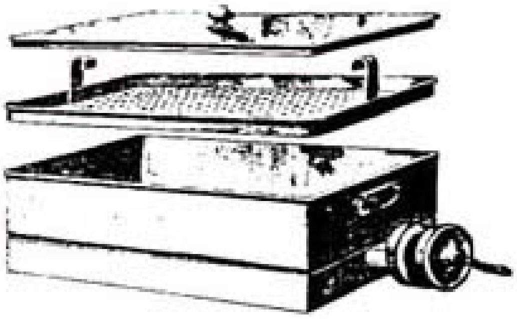
We supply a large and expensive apparatus, costing some £50, which is designed to bring about the thorough impregnation of water with the carbonic acid gas before the water is passed into the water bath itself. The arrangement is such that the water becomes absolutely saturated, which is not the case when chemicals are placed in the bath, as in this case the gas simply rises to the surface of the water at once, and the water does not actually become saturated.

Illustration and full particulars furnished on request.

Perle Bath Fitting. This is a fitting intended to lay along the bottom of an ordinary water bath, and it is composed of a metal frame 4 feet long by 1 foot in width. Four canes are set in grooves running the whole length of the fitting, connected together by a pipe. This pipe is connected by rubber tubing to a cylinder of carbonic acid gas, and, by reason of the porous nature of the canes, the gas bubbles through all along the whole length. Of course a reducing valve must be used to control the force of the gas from the cylinder and a manometer is really necessary to indicate same.

Order No.		
7988	Bath fitting, as described	£3 0 0
7989	Reduction valve with manometer	1 10 0

Electric Sterilizers.



These instruments are very convenient for the sterilization of the numerous small accessories and electrodes that are utilised for the various purposes. They are always ready for use and consume but little current.

Size of container 12 in. × 5½ in. × 2½ in., arranged with special plug so as to give two degrees of heat, one for boiling and the other for simmering. With lifting tray.

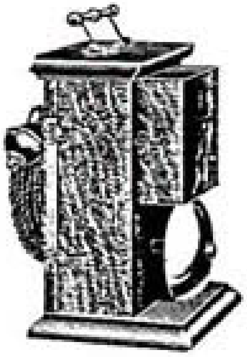
Order No.		
7990	**Nickel silver**	£3 10 0
7991	**Polished copper**	3 0 0

Size of container 8 in. × 4 in. × 1¾ in., arranged to provide one degree of heat only. With lifting tray.

7992	**Nickel silver**	2 2 6
7993	**Polished copper**	1 17 6

State voltage of main when ordering.

Sterilizers of every description and of all dimensions will be quoted for on receipt of requirements.

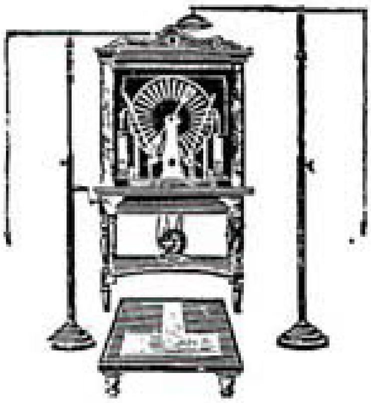


Invalid Bell. These portable bell sets are very convenient for temporary use between one room and another. They are very compact.

Order No.		s. d
7994	**Polished mahogany box,** 9 ins. high. Complete with handle, pear push, 12 yards silk covered flexible wire, and 2 large dry batteries	17 6
7995	**Same,** smaller, about 6 ins. high	10 6

Static Machines.

Wimshurst Machines for Franklinisation.



Wimshurst Machine, with 2 Plates (No. 8004), with Glass Cover. With Head Breeze and Point Electrodes on Stands and with Insulating Platform.

The illustration depicts a 2-plate machine for general Franklinisation. For the production of X-rays and for treating several patients simultaneously, very much larger and more expensive machines are necessary, but this small machine is perfectly efficient for all usual treatment.

The plates are of ebonite, which are not liable to breakage the same as are glass plates, they are more easily cleaned and moreover may be revolved at much greater speed, producing a correspondingly greater output. With our plates, too, the sectors are inlaid into the ebonite instead of merely being laid on the surface as with other ebonite and glass plate machines, the wear and peeling off of which is always a cause of trouble and lack of efficiency.

A glass cover is recommended and invariably taken. It protects the machine from dust and damage, and enables the air inside to be kept dry by heating or by chloride of lime, &c. A machine must be kept clean and dry or efficiency cannot be expected.

Insulated Platform. An insulated platform is an essential for static treatment, in order to insulate the patient from earth. It is of wood, with a metal plate on top, and with glass legs, constituting the finest insulation.

Wimshurst Machine for static electricity, self-exciting, with two 22 in. diameter ebonite plates, and with 2 Leyden jars. Mounted on highly-finished oakwood table. Including 1 point electrode (No. 8054), 1 ball electrode (No. 8056), 1 brush electrode (No. 8052) and 1 ebonite handle (No. 8072) to take the electrodes. In our machines the sectors are actually inlaid into the ebonite plates, so that the wearing and peeling off of the same is avoided, this constituting a distinct advantage while adding but little to the price.

Order No.		
8000	Arranged for **hand** driving	**£18 10 0**
8004	With **motor** for continuous current up to 120 volts	**26 0 0**
8008	With **motor** for continuous current up to 250 volts	**27 0 0**
8012	With **motor** for alternating current up to 120 volts	**29 10 0**
8016	With **motor** for alternating current up to 250 volts	**30 10 0**

With each motor is included a rheostat for controlling its speed, with switch, fuse and terminals mounted on white marble board.

If the machines are fitted with an elegant glass cover with lock and key, best make and finish in oakwood, the price increases **£6 0 0**.

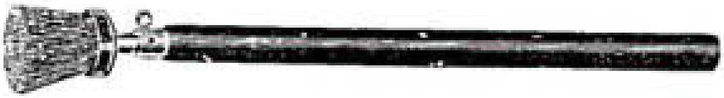
If in walnut or mahogany, instead of oakwood, the price for the table increases **15s.**, *and for the glass case,* **20s.**

If 2 incandescent lamps are mounted inside the glass case in order to keep the air dry, and which is recommended when a main supply is available, the cost is **12s.**

Static Machines.

Accessories.

Order No.		
8040	**Insulating Platform,** about 40 in. × 30 in., of polished wood, with metal plate on top and with four glass legs constituting the finest insulation. Similar to illustration on previous page, but with longer glass legs	£2 10 0



Order No.		
8050	**Tinsel Wire Brush Electrode** to screw on handle No. 8072	0 12 0
8052	**Multiple Point Electrode** of metal, plated. To screw on handle No. 8072	0 9 0
8054	**Single Point Electrode,** of metal, finely plated. To screw on handle No. 8072	0 5 0
8056	**Ball Electrode** of metal, 5 mm. diameter, on metal stem, plated. To screw on handle No. 8072	0 5 6
8058	**Same,** but with ball 15 mm. diameter	0 5 6

Order No.		
8070	**Tinsel Brush Electrode,** sliding in a glass cylinder. Can also be used for ozone inhalation. To screw on handle No. 8072	1 0 0
8072	**Ebonite Handle,** finely polished, with metal mount for the above electrodes to screw into	0 10 0
8080	**Floor Stand** of iron, finely enamelled and plated. With insulating glass rod in portion of its vertical rod and with plated metal rod or horizontal arm. Adjustable in height and made to carry the head breeze electrodes, &c. Similar to illustration on previous page	1 16 0
8082	**Head Breeze Electrode,** of metal, plated. For suspending above patient's head by means of floor stand. Bell shaped, with smooth surface	0 9 0
8084	**Same,** but plate shaped, covered by numerous points spread equally over its surface	1 17 6
8086	**Head Breeze Electrode** of wood, plate shaped, covered with numerous points. For use on floor stand	0 12 6

Static Currents.

A NEW INVENTION.

Static Currents from any X-ray induction Coil, working with its interrupter and switchboard as usual.

Just at the time of going to press with this Catalogue we are engaged in perfecting a new apparatus for giving intense static currents from an X-ray Induction Coil, working with its interrupter and controlled with its switchboard in the usual way.

This is a remarkable invention, destined to arouse world-wide interest, and will bring static currents into universal use. In America static machines are in general use (even for their X-ray work—though a spark coil is capable of far greater output and decidedly preferable), and the currents have been developed to great perfection, and are held in the highest esteem.

In this and other countries, however, the damp climate is against their adoption, and they are quite a rarity, despite the general desire to make use of this most valuable therapeutic factor.

Realising this, we have devoted much time and expense, in conjunction with a scientist of repute, to endeavour to obtain static currents in the manner referred to, and at last our efforts have met with complete success.

Static currents are charges of high potential, low milli-amperage, and absolutely uni-directional. All the static effects are produced by our new apparatus—for instance, the well-known static breeze, static wind, wave current, static-induced current, sparks, &c. In proof that the current is uni-directional we need only mention that an electroscope, a Leyden jar, or a static machine can all be charged by it. The patient on the insulating platform remains charged after the apparatus has stopped working, &c.

We are now engaged in the final details of construction. The apparatus will be a complete unit in much the same way as a high frequency transformer is added to an X-ray outfit for high frequency currents. It will be mounted up on a floor stand, and the cost will be about **£15.**

A special illustrated and explanatory leaflet will be ready at the same time as this Catalogue, wherein the apparatus will be fully described, together with the electrodes and accessories.

The apparatus is **absolutely reliable—unaffected by climate. Simple in design and manipulation.** Gives intense currents from a good coil the equal of the largest static machines.

Diathermy Apparatus.

Diathermy Apparatus, also known as Thermo-Penetration Apparatus, is a new method of treatment designed for the production of intense heat in the superficial tissues or at any given depth, also for attacking diseased bone, &c. The current utilised is a High Frequency Alternating current, but differing from the usual High Frequency currents in that the tension of the Diathermy current is much lower, and the intensity or milli-amperage much higher. As a matter of fact, with Diathermy we deal with amperes, and up to 5 amperes can be administered, though more generally about 1½ amperes are made use of in practical work.

A zone of coagulation is set up between the electrodes placed on the body, such zone being superficial, or of any depth desired, according to the form of electrodes used and the intensity of the current. The treatment is indicated in cases of tuberculosis of the skin and mucous membrane. Local anæsthesia is occasionally adopted when treating diseases of nose and throat, though in general the pain is so slight that anæsthesia is quite unnecessary.

Diathermy is also indicated in diseases of the larynx, tuberculous ulcerations of nose, ear passages, the vulva and vagina. Diseases of the conjunctiva are also treated, also syphilitic cases of a papulous or ulcerous nature.

The blood is coagulated under the influence of the current, and therefore Diathermy is indicated in cases of hæmorrhoids, polypus, and other such hypertrophies. It also gives most excellent results in furunculosis, a needle electrode being inserted into the boil.

A very wide range of cases come within the sphere of Diathermy, and its uses will still further extend in the immediate future, when the excellent results obtained become more generally known.

The apparatus as at present constructed takes the form of a Trolley Switch-table. Such an outfit works direct off an Alternating current main, but with Continuous current main a large Motor-transformer is required in addition, in order to provide the necessary alternating current for stepping up to high-tension.

We are refraining from giving further details and illustrations, as the apparatus is just in a transitionary stage, but a special pamphlet will be issued in the near future, a copy of which will be forwarded to anyone interested.

Photographs and full particulars of latest patterns, together with best prices, will be gladly furnished on request. Please state if current is Continuous or Alternating, and the voltage. If alternating, please state the periodicity as well as the voltage.

The present prices are :—

For Alternating current main	£40 0 0
For Continuous current main, including the Motor-transformer, which is essential	£60 0 0

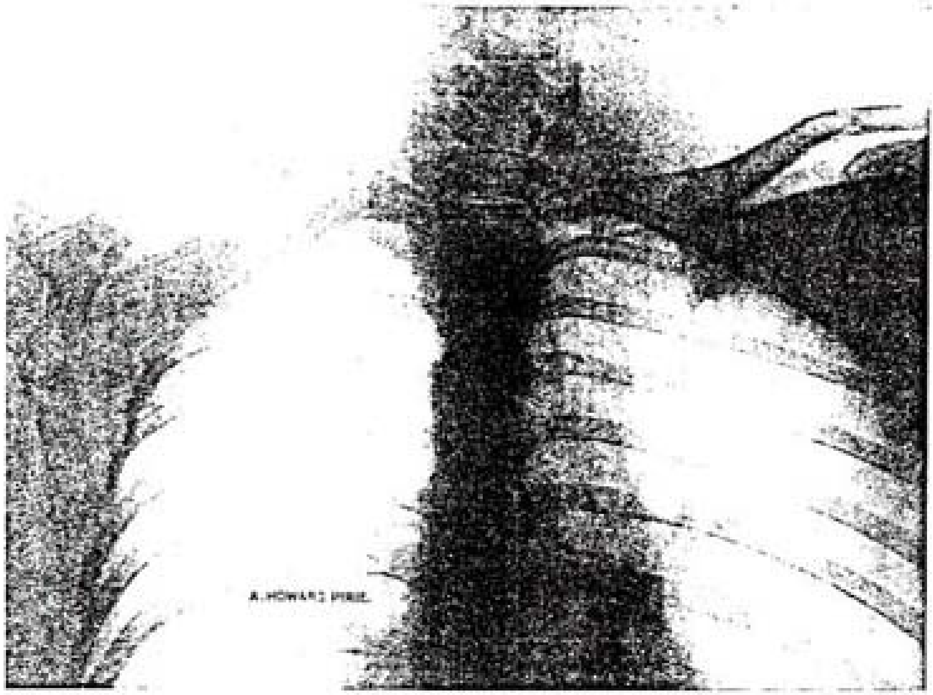
X=RAY

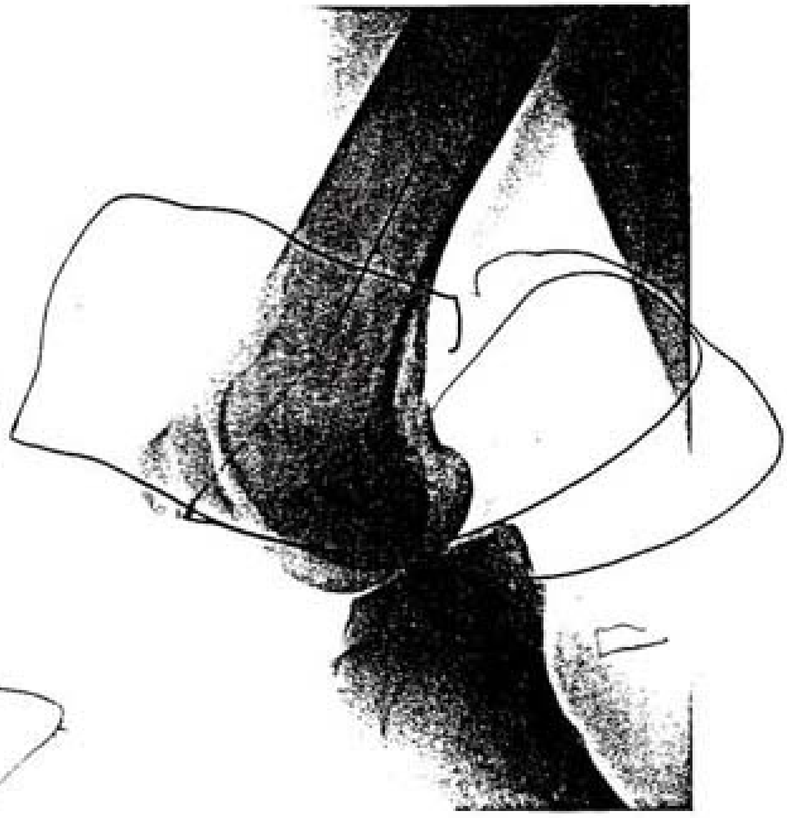
AND

HIGH FREQUENCY APPARATUS.

Practical Hints on the Selection of a Modern Outfit
and its Management.

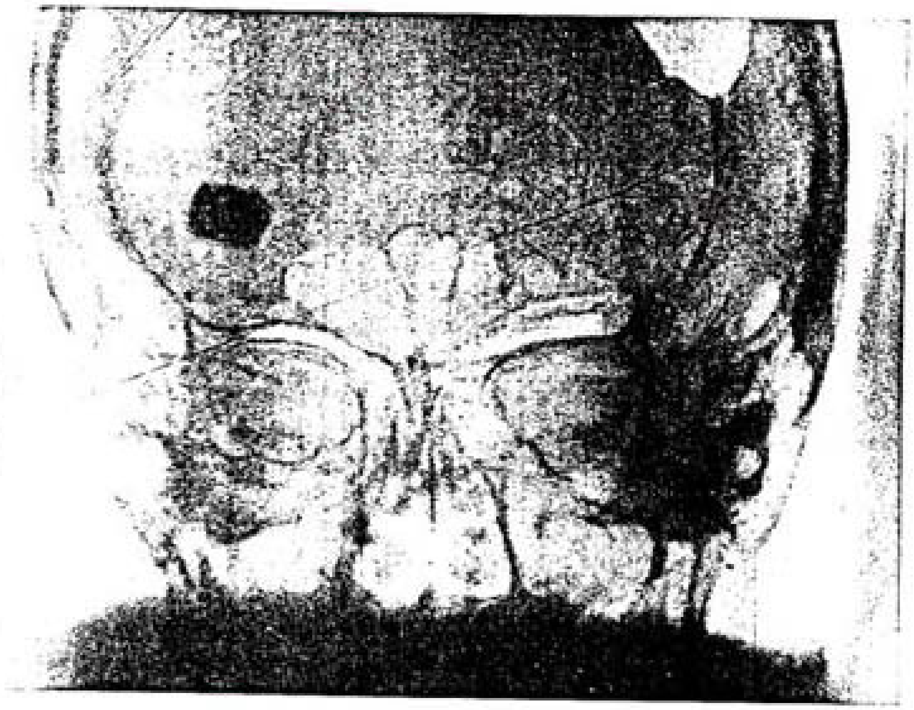
THE CAVENDISH ELECTRICAL CO., LIMITED,
130, Great Portland Street, London, W.


A. HOWARD PIRIE.



Bullet in Skull.

The Radiograph shows remarkable detail, especially in regard to the frontal sinuses. The actual negative shows detail much finer than it is possible to reproduce on the half-tone block.



Taken by Mr. Leonard A. Rowden, M.B., C.M., of Leeds.
Hon. Director Electro-therapeutic Department, General Infirmary, Leeds.

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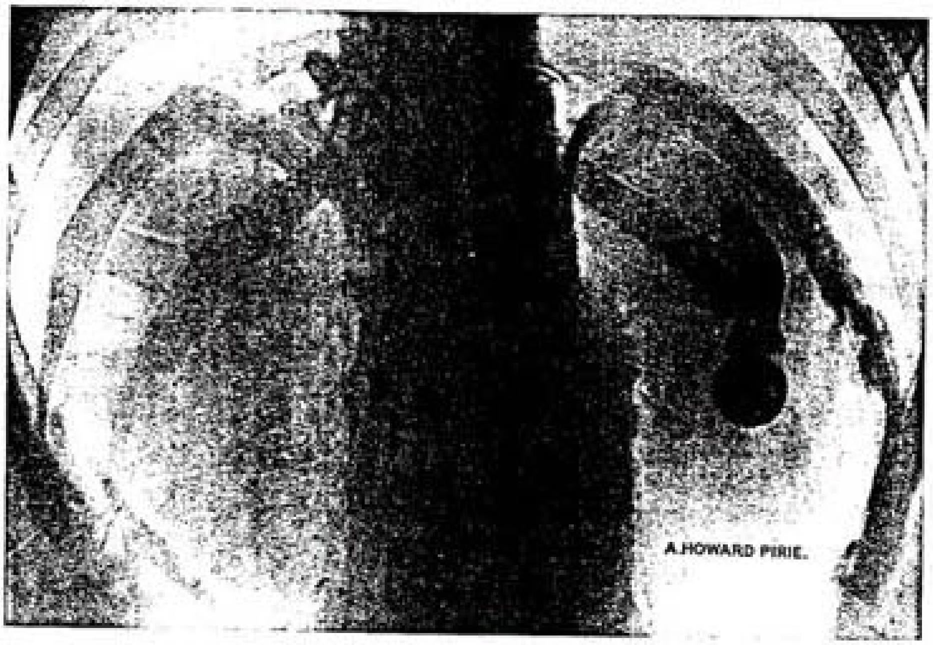


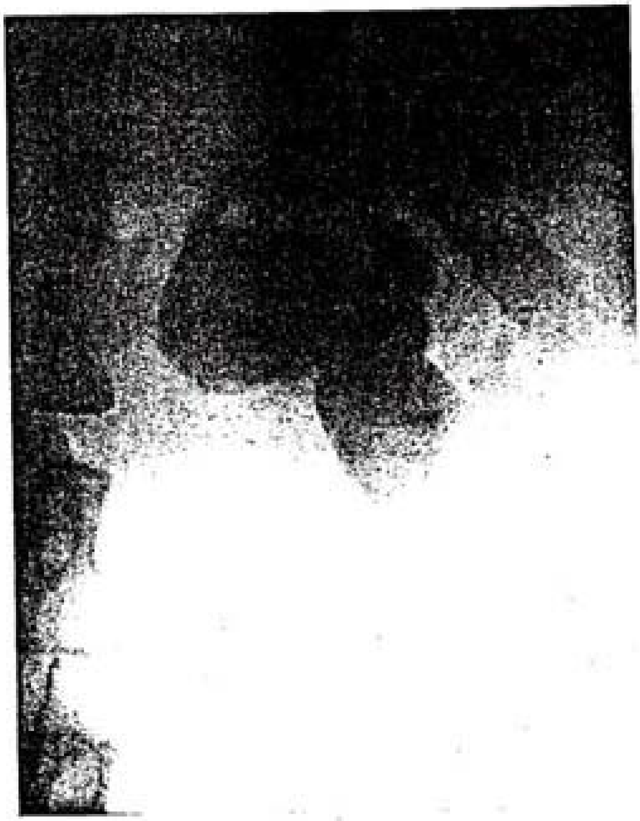
CALCULI IN KIDNEY. By A. Howard Pirie, B.Sc., M.D., Ch.B.

Reproduced by kind permission.

Radiograph of Calculi in Kidney.

Taken with 16 in. intensified coil, as listed page 189, working with centrifugal motor mercury interrupter, as listed page 193.

Exposure 4 seconds, with accelerating screen, as listed page 223.



Taken by Mr. Leonard A. Rowden, M.B., C.M., of Leeds.

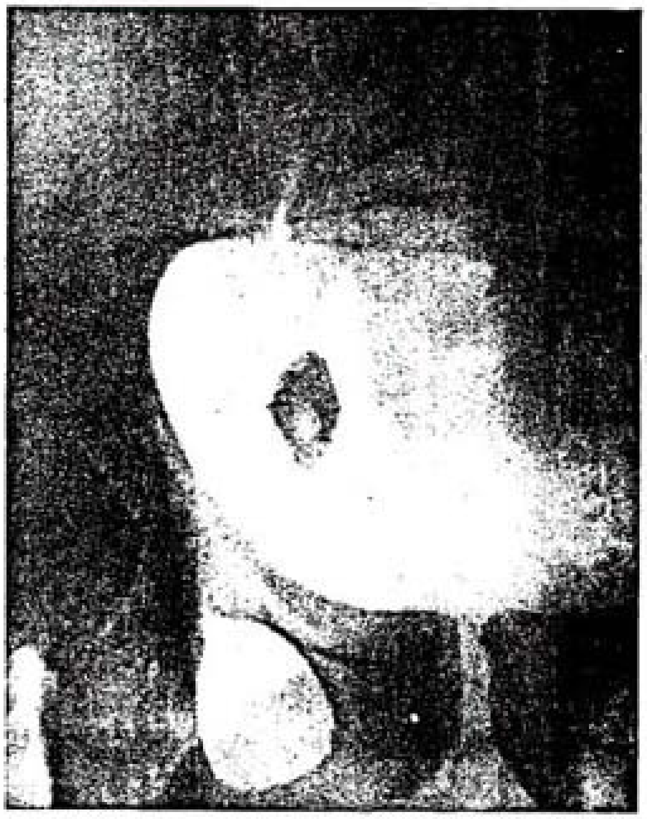
Hon. Director Electro-therapeutic Department, General Infirmary, Leeds.

Reproduced by kind permission.

The actual negative shows much finer detail and contrast than it is possible to produce on the half-tone block.

Radiograph of Calculus in Lower End of Ureter.

Taken with 16 in. intensified coil, as listed page 189, working with centrifugal motor mercury interrupter, as listed page 193.



Taken by Mr. Leonard A. Rowden, M.B., C.M., of Leeds.
Hon. Director Electro-therapeutic Department, General Infirmary, Leeds.

Reproduced by kind permission.

The actual negative shows much finer detail and contrast than it is possible to produce on the half-tone block.

X-Rays.

The science of X-rays continues to gain more and more adherents each year, and its sphere of usefulness continues to extend in other directions, as witness its present adoption into Dentistry.

The developments that have taken place since its first introduction have always been rapid, but never more rapid than of recent time, and this remark applies with equal force and truth to both the therapeutic and purely technical sides of the science.

Anyone following the course of development with close attention cannot have failed to note how largely its scope has extended. The rays are no longer used merely to locate foreign bodies, fractures, &c., in confirmation of diagnosis, but now serve much more important duties, such as the study of a bismuth meal during its whole progress, &c.

Also, in therapeutic work there have been equally remarkable strides. The nature of the secondary X-rays that are set up by the impinging of X-rays on various metals is a new field of investigation, in connection with which it is interesting to note that patients have been given metallic silver for treatment of the alimentary tract by secondary radiations set up in this manner, and in many other respects the therapeutic side is being carried forward on strictly scientific lines.

The numerous articles that appear in the different journals bear testimony to the progress being made, but, naturally, we ourselves are more concerned in the technical development. The improvement of the various appliances has been carried forward with great rapidity by the warm co-operation that exists between the profession and such firms as ourselves who specialise entirely in this class of apparatus.

The modern Intensified Spark Coil and modern Centrifugal Motor Mercury Interrupter constitute a vastly more powerful combination than the early types, and infinitely better results are thus obtained in all branches of the work.

The necessity for protection to the operator and patient has brought into use a new and varied class of apparatus, and nowadays there is no excuse for anyone contracting dermatitis.

The methods of work are now clearly defined both in regard to radiography and treatment. In the latter respect the introduction of pastilles to denote dosage is a useful step forward. The measurement of the milli-amperage actually passing through the focus tube is now also recognised as essential, both in connection with exposures for radiography and in treatment, whereas previously we were content to simply measure the primary current circulating through the spark coil, which, as a matter of fact, has no direct relationship to the current passing through the focus tube itself.

In all such respects the appliances and methods have now settled down on regular lines, and we will now consider them at greater length.

Spark Coils v. High Tension Transformers. Some two years back certain makers endeavoured to arouse enthusiasm over the high tension transformers, claiming various advantages for them over the induction coil which previously had been universally used. The transformers were put forward as something quite new, whereas they were merely a revival with improvements of a system tried long before. The chief claim advanced on their behalf was their capability of giving an intense output (milli-amperage), and second only to this was the claim that they were entirely free from reverse current.

Both advantages were well justified in so far as they referred to the spark coils hitherto in use, but they do not hold good at all in the same relation to the modern intensified spark coil, working with a modern motor mercury interrupter on the latest centrifugal principle.

The modern induction coil is wound on totally different principles to the early types, and is capable of providing the most intense discharges that can be utilised through any focus tube, even to the extent of instantaneous radiography. Our intensified coils, working with our centrifugal motor mercury interrupter provide a current free from reverse current with any air gap exceeding one inch, which means that it is absolutely a negligible quantity.

These points are dealt with fully in the following pages relating to coils and interrupters, where reasons are advanced and proof given. For the moment, therefore, we need not enter further into this, but will confine ourselves to a comparison of other points as between the two systems.

The high tension transformer is very cumbersome, and represents much more "mechanism." The discharge is not capable of perfect control and consequently there is much unnecessary strain on the focus tubes. The most essential point of all X-ray work consists in running any given tube to full advantage without overstraining, a matter which will be fully explained under the chapter on focus tubes. The high tension transformer cannot really be made to work with a weak current, as is necessary for certain classes of tube. Moreover, the wave form of the current is such that it cannot easily overcome the great resistance of the vacuum of a tube until a powerful discharge is employed.

With a spark coil, on the other hand, perfect control is secured between absolutely extreme limits, so that the discharge can be accurately controlled to suit the vacuum of any tube, permitting its being worked to the best advantage without any overstraining.

A modern coil is reliable to the last degree. It is unaffected by weather conditions such as dampness; its efficiency remains always the same, it is not subject to wear and tear as must be any apparatus, transformer or otherwise, which has a motor or other heavy moving parts, and in consequence it has a lifetime extending over many years.

Although, as above remarked, there were attempts made to introduce the high tension transformers some two years back they were unsuccessful, and very few workers have adopted them. The latest intensified spark coils and the latest interrupter provide results that cannot be excelled by any other combination of apparatus, and it is now agreed on all hands that they constitute the best form of high tension generator for all X-ray work. The transformers are unable to claim a decided advantage over such a combination on even a single point, and in view of the fact that the transformer costs three or four times as much it is small wonder that their general adoption did not come about.

It will therefore be clear that we recommend the coil outfits now and as we always have. In fact, we think so little of the transformer that we are not even including one in this catalogue. We do not say that the high tension transformer cannot possibly claim some advantages, such as on the score of intensity of output, over some spark coils and interrupters, but we do maintain that the results given by our latest intensified coils with our own centrifugal interrupter cannot be beaten.

It is useless to compare the transformers with the admittedly inferior, inefficient earlier types of coil, for the modern coil is infinitely superior on all points, as will be understood from the following chapters relating specially to them, and wherein the technical differences in construction, &c., are explained.

Intensified Spark Coils.

The term intensified spark coil is used to designate spark coils wound on the latest approved principle. Of very recent time great improvements have taken place in the construction of spark coils. In the early days a coil was constructed with the object of giving as long a spark as possible almost entirely regardless of its intensity or milli-amperage. They were accordingly wound with a very fine wire on the secondary in order to create a very high tension, such as is necessary to give a long spark.

The modern coil is wound with a comparatively stout wire on the secondary and of corresponding length, as nowadays it is realised that spark length is of very secondary importance compared with the milli-amperage. Thus the latest coils are designed to give the greatest output possible to obtain, and one or two makers have even suggested that spark coils should be standarised according to their output across a given air gap instead of by spark distance as in the past. Only sufficient voltage or tension is required to overcome the resistance of the vacuum of the focus tube, and all voltage generated over and above that is of no use and is only generated at the sacrifice of milli-amperage.

From this brief description it will be gathered that the modern coil is a great improvement on the earlier types, giving a much greater output. Ever since X-rays were adopted by the medical profession there has been a universal desire to reduce the times of exposure and by the aid of the latest intensified coils exposures are now reduced to the absolute minimum. Radiographs of the heart and other parts can be taken in one-hundredth of a second, and, in general, exposures have been brought to the instantaneous.

Rapid Radiography. Instantaneous radiography has been known for some few years past, but has only been accomplished by means of the Wehnelt Interrupter working with an exceedingly heavy primary current, actually between 60 to 100 amperes. Such conditions were of course far from practical for the general body of X-ray workers, especially as the use of the Wehnelt Interrupter is unavoidably associated with a number of serious drawbacks. They make a great noise in working; the electrolyte heats up after some few minutes' run and causes the interrupter to cease working. The consumption of platinum is very great and also the consumption of current. They require much careful handling and tuning up before they can be got to work smoothly. They necessitate a more difficult, more complicated and more expensive outfit. They do not permit of fine adjustment of the discharge from the coil according to the condition of the vacuum tube. In every way they are very bad for the focus tubes, but more especially for two specific reasons: (1) the lack of control of intensity of discharge, (2) the generation of enormous reverse current. The lack of control is accounted for by the reason that a Wehnelt Interrupter is not set in operation without a fairly heavy current, and the generation of reverse current is consequent upon the very nature of the Interrupter.

It was therefore quite evident that the electrolytic was far from satisfactory, but up to very recent date there was no alternative for rapid work. The Motor Mercury Interrupters that were in use were all exceedingly slow compared with the enormous rapidity of interruption of the electrolytic break, and moreover they were not able to pass the same heavy amperage. Since there was no scope for developing the existing types of mercury dipper or mercury jet breaks to the necessary perfection, a new system altogether had to be looked for. It was then that a Motor Mercury Interrupter working on a centrifugal principle was evolved. This Interrupter introduced a completely new principle and one that has been found infinitely better than the principles hitherto adopted. The earlier types of Motor Mercury Interrupter were almost entirely on two principles: (1) the dipper type with which a wire or paddle was made to dip in and out of a cup of mercury, the necessary movement being imparted by electro motor, (2) the other and by far the greater part were of the mercury jet principle, some adopting a stationary jet through which copper contacts revolved, and others adopting stationary contact blades and a revolving jet. As has been remarked above, all these interrupters in common were unable to pass a really heavy amperage, while moreover their rapidity of interruption was comparatively slow. Otherwise they were all very efficient, very much more so than the electrolytic interrupter. They permitted of perfect control of the coil discharge from very weak to strong, they worked quietly and reliably, were free from complication or difficulty, and moreover the amount of reverse current was much less than with the electrolytic. Obviously the task was to produce a motor mercury break, combining the rapidity and the current carrying power of the electrolytic with the advantages of the mercury break. This was effected by the introduction of our Centrifugal Motor Mercury Interrupter, and when we state that in addition the objections of the electrolytic breaks were eliminated it will be seen that the break is as near perfection as possible.

Construction of the Centrifugal Break. In this Interrupter a pear-shaped steel bowl is mounted vertically above an electro-motor, to the armature of which it is attached. Thus when the motor rotates the pear-shaped bowl is rotated also. Inside the bowl is placed a small quantity of mercury, actually about 10 ounces. This, by centrifugal force, travels up the side of the pear-shaped bowl until it reaches the greatest diameter, where a bed or groove is made to receive it, and so the mercury forms a complete ring round the inside of the bowl and rotates with it. On a vertical spindle in the inside of the bowl is fitted a fibre wheel made to revolve freely on ball bearings. This disc is not placed in the centre of the bowl but over to one side, so that its edge engages with the ring of mercury and is thereby rotated by it. The disc has a copper segment right across it. The current is led to the bowl and mercurial ring and is also led to the segment of the disc. Thus the circuit is established whenever the segment plunges into the mercury ring, and is broken instantly on leaving. On account of the broad surface of the copper segment and by reason of its actually plunging into the mercury ring, it follows that the break is able to carry the very heaviest currents. The rapidity of the interrupter approximates to that of the electrolytic, and is obtained in the following simple manner without any gearing mechanism and without running the motor at abnormal speed. The motor and bowl revolve together at about 2,500 r.p.m., and therefore of course the mercury ring also. The disc being only about half the diameter of the bowl, it follows that it rotates twice to every revolution of the mercury ring, which gives a rapidity of 5,000. The disc makes and breaks contact on each end of its copper segment, thus giving the great rapidity of 10,000 interruptions per minute. By increasing the diameter of the bowl or by reducing the size of the revolving disc (or both) or by using more copper segments, the rapidity could be taken up very much higher still, but it has been found by careful and prolonged experiment that the efficiency is highest with about 10,000 interruptions per minute.

Efficiency. This is easy to understand, because the time factor must be considered when the interrupter is working a spark coil. The real efficiency of a coil is secured by the suddenness with which the iron core in the primary attains its maximum degree of magnetic saturation and loses it. In accordance with this essential condition, the iron core in our latest coils is made somewhat smaller than was the case with the previous slower working interrupters, in order that it should reach and lose its magnetism with a rapidity corresponding to that of the interrupter.

This is the real secret of efficiency, though there are other factors that also have to come into consideration, such as the diameter and length of wire on primary and secondary coils, the capacity of the condenser, &c. **Unless the coil and interrupter be constructed to exactly suit one another and to work in entire harmony, it is not possible to produce maximum efficiency.** See pages 180 and 181.

Most perfect regulation between absolute extremes is obtainable so that the discharge from the coil can be exactly suited to the condition of the vacuum of each tube, that each may be run to the utmost advantage without overstraining. In connection with this most important point please refer to the reading matter relating to X-ray focus tubes elsewhere in this list.

X-Ray Switchboards.

Series v. Shunt Switchboards. Switchboards are constructed on two principles so far as the resistance is concerned, known as "series" or "shunt." A series resistance provides perfect regulation of the amperage traversing the primary coil of the spark coil, but allows the full voltage of the main to pass without reducing its voltage more than a very little. With a shunt resistance it is possible to pass any desired voltage through the primary coil, and this, of itself, provides regulation of the amperage.

It is stated that the reverse current is greater the higher the voltage traversing the primary coil, and objection is taken to the series board for this reason. Although this may be a fact in itself, it does not by any means follow that because a high voltage is being used in the coil that the reverse current must be great. Everything depends upon the construction of the coil and the interrupter, and the accuracy with which they are suited to one another, and even other factors come into consideration as well, so that the mere fact as above referred to does not substantiate the objection.

In years gone by the Motor Mercury and Platinum Hammer Interrupters were quite unsuitable to breaking a high voltage with the necessary and essential rapidity or suddenness. Moreover, the coils were all wound for low voltage, as a rule working from accumulators giving from 12 to 24 volts. A coil wound to run direct from high voltage mains needs to be constructed on much better principles, the insulation requires to be superior, and in every way the technique demands much greater skill and resource.

Accumulators are always unsatisfactory things for the doctor to have to handle, requiring far too much time to be given to looking after their condition. It was only natural, therefore, that it was generally desired to work X-ray outfits direct from the mains. Faced with this demand the different makers introduced the shunt switchboard, designed to shunt down the high voltage mains so that the low voltage coils could be worked.

As mentioned above it required more than ordinary technical knowledge to construct a coil capable of working direct off the high voltage mains in a really efficient manner, and without risk of breakdown. For our part we have always advocated working direct off the high voltage mains, and have, therefore, always supplied coils and interrupters accordingly, devoting special attention to the conditions to be met.

In other chapters relating to our new Intensified Spark Coils, our new Centrifugal Motor Mercury Interrupter, etc., we are dealing with the technical construction of these important appliances, and setting forth the advantages they offer and the lines on which they have been developed; the care taken in the manufacture, and the excellence of insulation; the manner in which they are specially built to suit one another, and all other points that go to prove that there is "something" in scientific manufacturing, working with a definite conviction that one's principles are right and striving to carry out the ideal to the highest perfection.

Thus, by reason of such study and experience, we claim to have reduced reverse current to a negligible quantity. A 16 in. or 20 in. Intensified Spark Coil running with our Centrifugal Motor Mercury Interrupter does not give any reverse current with any air gap exceeding one inch, as shown by an oscilloscope tube, and this, when running direct off any high voltage main up to 250 volts through an ordinary "series" resistance. Therefore, the claim advanced on behalf of the shunt resistance is not borne out in practice, whatever it may be in theory.

Another objection levelled against the series resistance is that efficient control is not secured to enable the discharge of the coil to be so weakened as to suit new "soft" focus tubes. This is a strange claim to make, because the remedy is actually in the hands of the maker, inasmuch as it is only a question of the amount of resistance provided on the switchboard. It has been stated that the shortest spark that could be obtained with a series resistance is some five inches, from a 16 in. coil. Under certain conditions this will be so, but in the same way one might as well state that the shortest spark obtainable is 10 inches, which is just as well a fact under other certain conditions.

Therefore, with the remedy in his own hands, the maker who objects to the series resistance on this ground is taking rather a strange position. For our part we provide perfect regulation between absolute extremes, enabling the very weakest currents being obtained for the softest tubes, and by gradual steps upward to the most intense discharges as are utilised for rapid radiography. Therefore, however this objection may apply to other makes of "series" resistance boards, it does not apply to ours.

Naturally, the obverse side of the objection we are dealing with is a claim for perfect regulation by means of shunt resistances, whereby the voltage traversing the primary coil is altered as desired. If the regulation of the series board we supply is perfect, as we assert it is, it follows that the other method cannot be better. To our minds the question is: Is it as good, or perhaps we should say, granted that it is as good, are there not other objections peculiar to it? Most decidedly there are.

We are explaining at considerable length on other pages, that no X-ray outfit can be really efficient unless the various factors concerned, viz., the coil, interrupter, condenser, &c., are specially built to suit one another to work in complete harmony, an essential condition of what we term efficiency. Now, this being so, it is quite obvious that any one factor cannot be altered or varied without throwing out the whole. In the construction of coil, interrupter, &c., to suit one another, the voltage for which they are made is the governing condition. Each outfit is, and must be, manufactured according to the voltage it is to work with.

Therefore, if accurately suited to one another on one voltage, they cannot be accurately suited to one another on a different voltage.

Where the voltage is varied the outfit can, of course, be adapted to one certain voltage of the possible variations, but this only signifies that it is not accurately suited to the other voltages, so that the adjustment must be either quite right or quite wrong. The only alternative possible is to compromise the situation, with the result that although never extremely wrong it is also never extremely right.

Not only does variation of voltage affect the spark coil as just referred to, but at the same time it affects another of the essential factors, viz., the condenser. With our own coils working direct off a certain high voltage main the capacity of the condenser is carefully taken into consideration, and is every bit as essential a factor as either of the others. Therefore, we have no need for a variable condenser as some makers introduced some time back, thereby adding further difficulty and complication to the outfit. If one is going to start varying his voltage, varying his primary windings, varying his condenser and varying his amperage, and wishes to get the several factors into harmony with one another, well, a little thought will soon convince one of the number of combinations possible.

For the same reason as we do not advocate varying the voltage through the primary coil, so we do not advocate variations of the primary windings. A variable primary is essential if working with an electrolytic interrupter but serves no purpose whatever with a mercury interrupter. Actually, of course, it is an objection, and a serious one too. No factor in an outfit can be varied if that outfit is to work in harmony and provide highest efficiency and best results. It is clearly the only duty of the manufacturer to comply with the conditions necessary to secure the highest efficiency with his own goods, and also to make his outfits as simple as possible. The endless number of variations that are obtainable with some outfits are the very reason of the operator's failure, since the operator cannot be expected to be a complete master of the highly technical points of the manufacturers' own business, nor yet to have had his experience.

This point carries even more truth, because it is recognised that the very best results are only possible when each operator has become a master over the peculiarities of his own outfit, according to his current, his class of work, &c., and how is one to become such a master if the conditions are continually changing?

We have another objection against the shunt resistance, viz., that it is extremely wasteful, as it consumes from the main twice as much current as is utilised in working the spark coil, that is to say, if 10 amperes are traversing the coil then about 20 amperes are being consumed from the main. This is a very serious matter to those doctors or hospitals where the apparatus is much used, or where used for lengthy periods as in Therapeutic treatment, &c. Neither does it end here, because it means much greater initial expense in having the main cables laid, or it may mean and frequently does, that existing cables are not strong enough, although amply strong enough to work an outfit such as we recommend with a series resistance. Still further, the switchboard itself costs more, on account of the difference in the resistance, &c.

Many of the shunt switchboards are only provided with a rheostat whereby the voltage passing through the primary coil can be varied between certain limits, an increase in voltage producing a corresponding increase in the amperage. It follows from this that to increase the amperage one must perforce increase the voltage. If there is anything at all in being able to choose a voltage of some definite tension for some definite purpose, then such voltage must not be interfered with, but at the same time one must be able to increase the amperage to suit the tube in use and the work in hand.

Therefore, if we are supplying a shunt board ourselves, we fit a rheostat for varying the voltage, and another for varying the amperage independently. Of course, actually it is impossible to increase the amperage for any class of electrical apparatus without affecting the voltage a little, a drop of tension being unavoidable when a greater load is taken. But with the special additional rheostat to regulate the amperage independently, the voltage chosen remains steady, whereas without such second rheostat the drop in tension is considerable.

In the case of existing coils wound for low voltage which it is desired to work from the mains, it is invariably much cheaper both in regard to initial cost and subsequent maintenance to have the primary coil re-wound to suit the main, and operate it with a series resistance, than to introduce a shunt resistance board in order to reduce the main to low voltage. This can always be done, and we have frequently done so in the past, and the advantages gained are very great. This modification is thoroughly satisfactory, and can be recommended to all who have old outfits working with accumulators and who desire much better results.

Focus Tubes.

The whole success in all branches of X-ray work depends upon a thorough knowledge of the focus tube. One may be working with the finest spark coil and interrupter in the world but it counts as nothing if correct judgment be not brought to bear upon the selection of a suitable focus tube for the class of work to be undertaken. This intimate knowledge of focus tubes is only to be acquired by considerable experience, but certain general principles can be laid down for the benefit of the beginner.

Focus tubes are universally spoken of as being in three classes, viz: soft (or low), medium and hard (or high). The soft tube contains a little more residual gas than the medium tube, and the medium tube of course occupies a similar relationship to the hard tube. The X-rays given out by a focus tube depend upon the condition of the vacuum. The rays from the soft tube have but little penetrating power and would show the bones of the hand quite black on a fluorescent screen. A medium tube with its greater penetration would show the bones of the hand grey on the screen, while a hard tube will show the bones of the hand quite light. The soft tube has its purpose for therapeutic treatment (where a more superficial action is required) and for radiographs of limbs and shallow parts of the body. The medium tube serves for general radiographic work and for screen work, while the hard tube serves also for screen work and for very rapid radiography. There are of course infinite degrees of vacuum between the two extremes, and the terms "medium low," "medium high" and "very high" are sometimes used.

Unless specially ordered to the contrary for special reasons, all focus tubes are delivered soft by the makers, since this is the beginning of their lifetime and each tube gradually passes through all the various stages until eventually it becomes extremely hard. This is accounted for by reason of the small quantity of residual gas remaining in the vacuum being used up as time goes on. This brings us to the question of reverse current.

Reverse Current. An induced current is generated in a coil when the primary circuit is made and when it is broken by the interrupter, but the current on "break" is infinitely stronger than the current generated on closing the circuit, and is the current utilised through the X-ray focus tube. The current generated on closing the circuit flows in the reverse direction. A focus tube is constructed with a concave cathode in order to concentrate the cathode rays upon the anti-cathode, a target put purposely at the point of focus of the cathode rays. If, therefore, the closing current flows in the opposite direction, it follows that the cathode rays will leave the anti-cathode, travelling onward until they strike the wall of the tube which thus becomes anti-cathode and whereby X-rays are generated.

In order to get a true picture of any object, approximately true to size and with a sharp and clearly defined outline, it will be understood that the ray striking such object must be a straight ray and not divergent. This is one reason why the focus tube is kept as far from the object as is possible according to circumstances. In the same way for important work it is customary to utilise a centring device in order to prevent distortion. A simple device consists of two cross wires placed the one a little distance to the front of the other so that when the straight ray is obtained the shadow of the one cross falls right on top of the shadow of the other.

It will thus be understood that X-rays generated by reverse current strike the object at all angles, thereby causing distortion and numerous delusive shadows instead of a clear outline.

The cathode rays disintegrate the metal of the electrode they leave and this disintegration is greater the greater the atomic weight of the metal. It is for this reason that the cathode is made of aluminium. The anti-cathode has a surface of platinum backed by massive copper or other metal, on account of the enormous heat generated by the bombardment of the cathode stream. When, therefore, the cathode rays caused by reverse current discharge from the anti-cathode, there takes place a very considerable disintegration of the platinum, the minute atoms being torn off by the rays and deposited upon the glass wall of the tube. These atoms of platinum have a great affinity for air and rapidly absorb the residual gas remaining in the vacuum, thus causing the tube to become hard very quickly and therefore, of course, correspondingly reducing its lifetime. They also cause the tube to assume a black, sooty appearance.

In a modern X-ray outfit such as that constituted by our new Intensified Coils and Centrifugal Mercury Interrupter, reverse current, even if existent, is absolutely negligible. Thus it is possible to obtain radiographs possessing much better definition and clear detail, and for the same reason the lifetime of the focus tubes is greatly prolonged and their work throughout the whole time much improved. With outfits where much reverse current exists, valve tubes, spark gaps or other devices are introduced into the circuit to suppress same. The elimination of reverse current is only possible by a coil and interrupter of the highest class, constructed on the best principles with every care and attention in the manufacture and, above all, only when coil, break, condenser and other factors are specially built to suit one another to work together as a whole in harmony. For valve tubes, spark gaps, etc, please refer to pages 218 to 220. For oscilloscope tube for detecting reverse current, see page 217, and for further remarks concerning our claims respecting elimination of reverse current see pages 170, 181, &c.

Handling of Focus Tubes. When a new (soft) tube is received from the makers it should be used with very weak currents for some weeks, either for therapeutic treatment or for very light radiographic work. So treated, the tube will gradually become medium hard, when it should be taken into use for screen work and for ordinary radiographic work. This tube should then be set aside for such work and a new (soft) tube should be started behind it in the same way. Thus, in course of time, the doctor becomes possessed of a range of tubes with different degrees of vacua, each specially suited for a certain class of work, which work the tube should be strictly reserved for, until such time as its vacuum becomes higher still, and so necessitating a further step upward in the scale. All modern tubes are fitted with devices for bringing down the vacuum when they have become too hard, that is to say, too hard to give good work, or, perhaps, even so hard that the current prefers to spark outside the tube instead of passing through it.

It is a recognised principle that the first use of a regeneration device should be delayed as long as ever possible, and subsequently should be used as seldom as can be managed. If a soft tube be given heavy currents at first it is quite unable to stand same, with the result that the vacuum comes down lower still, and in some cases the tube may be completely spoiled and require re-exhausting.

Great patience is necessary in training up a new tube, but when once trained up it will stand the very heaviest currents and provide the best results. It is even laid down as a principle that a tube is much better when worked up on its own outfit than when worked up otherwise. Artificial hardening of a tube by sending the current through it in the reverse direction should never be resorted to, except by those who are expert in the work, and even then it is a doubtful procedure because the tube can rarely maintain a steady vacuum when so treated, although it may, perhaps, be temporarily hardened.

One must, therefore, anticipate his requirements in regard to focus tubes so as always to have a good selection ready for each class of work. It is impossible to use just one or two tubes and endeavour to cope with every class of work, and nothing is to be more condemned than the continual artificial hardening and softening of just one or two tubes.

General Remarks. New tubes on arrival should be wiped clean and dry, and should be given time to take to the temperature of the X-ray room before use. Every time before use a tube should be wiped free from dust and moisture. In use take care that the cables from the coil are clear of the tube, as otherwise the current is likely to jump across and perforate it. A tube should always be fixed in the stand or held in the hand by the cathode stem as being the strongest part and intended for it.

The whole secret of successful work depends on giving the focus tube just that amount of current which it can properly carry. Any attempt at overstraining in the endeavour to obtain greater penetration always means failure. The amount of current a tube can stand depends upon the condition of its vacuum and the extent and manner in which it has been worked up. Careful observation of the behaviour of tubes will soon enable the beginner to grasp the whole subject.

The Handling of an X-Ray Outfit.

A brief outline of the erection and handling of an X-Ray equipment.

Installation. The installation of one of our standard outfits is a matter of simplicity that can be carried out by anyone in a very short time. A pair of strong iron brackets are fixed to the wall, or a wooden bracket or shelf if preferred, and the coil placed thereon. If desired the coil can just as well be placed on a table, etc. The height is of no great importance, but it will generally be found that some 4 ft. from the floor is most convenient.

The switchboard is mounted on the wall some few feet away from the coil, or as far away as may be desired, if there is some special reason for doing so. Otherwise, if the board is mounted on the wall some three or four feet to one side of the coil, it will be found convenient, and the operator thus stands *behind* the X-ray tube when manipulating the board, and so is away from the rays.

The interrupter is suspended from a wall hook by means of a strap, or may be simply placed on the floor. It is usually most convenient to keep it lower down than coil and board, and on the same side of coil as that taken by the board. Thus it is within easy reach should any adjustment of the contact be desired in conjunction with the regulations being carried out on the switchboard itself.

The terminals at the top of the switchboard are for main connection, and labelled accordingly. Cables capable of carrying some 15 to 25 amperes are laid into the room and simply connected to the terminals of the board. The primary coil of the spark coil is fitted with 2 terminals: the polished wooden base of coil has 2 terminals which connect to the condenser inside. The motor of the interrupter has 2 terminals and the interrupter proper has 2 terminals.

On the switchboard are 4 pairs of terminals corresponding, each pair clearly labelled "coil," "condenser," "motor" and "interrupter." The set of flexible cables supplied are merely joined between the terminals on the coil and the corresponding terminals on the board, and so on.

Separate instructions are always sent relating to the interrupter itself, telling how to place in the mercury and paraffin oil. This takes but five minutes, and the whole erection only about an hour. The outfit is then ready for use.

Starting the Outfit. The tube stand is placed a few feet straight in front of the coil. A focus tube is taken, wiped free from dust and damp and then placed in the tube clamp of the stand. The clamp should always hold a tube by its cathode stem, which is the long; strong stem some 8 inches or so in length by some 2 inches or so diameter. The cathode stem should stand vertically with the main bulb of the tube uppermost.

The two specially insulated high tension cables supplied are then connected from the secondary terminals of the spark coil to the focus tube, one connecting to the eyelet at the bottom of the cathode stem previously referred to and the other going to the anode, which is the small electrode usually diametrically opposite the cathode. In any case it is the small electrode opposite the cathode, not the large electrode (anti-cathode or target) which is also opposite.

The two cables are merely hooked into the eyelets of the different electrodes. The cables must not be allowed to rest on the glass of the tube, nor should they touch the metal parts of the tube stand, nor one another. They should be kept quite parallel and free from coil, tube, floor, couch, stand, &c. It is therefore of advantage to use cables as short as possible, so that there is no slack. For this reason spring metal tapes are often used, as listed elsewhere.

Everything being now ready, first see that both rheostats on the board are on weak. Then turn on the switch for the motor of the interrupter and move the rheostat for motor gradually across from weak (or slow) towards strong (or fast). Then turn on the switch for primary coil and the focus tube will then light up.

Direction of Current. If the two cables from the coil have been connected to the tube in the right way, the front half of the bulb in front of the target or anticathode will appear full of a green fluorescence, with a clean division across the tube level with the target. The back half of the tube will be practically empty.

If the cables are wrongly connected the whole of the bulb will appear full of a patchy irregular light, without any sharp division across the tube as just mentioned. If this be noticed, the primary switch should be put off instantly and the direction of the current reversed by means of the pole-reverser on the switchboard, or, if a reverser be not available, then the two cables on the tube are changed. It is advisable always to avoid the current being sent through the tube in the wrong direction. . . . . For the bad effects of "reverse" current, see chapter on Focus Tubes, and also on Coils and Interrupter.

To ascertain the polarity of the current, one has only to let the coil spark across its discharge rods instead of connecting it up to a tube. The point of the discharge rods should be positive (+), and if so, the current will leave the point and spark more or less straight to the centre of the plate. If, on the other hand, the plate of the discharge rods is positive, the current will then leave the edges of the plate and spark across to the point. Under this condition the current shows much less desire to spark across at all, and it is possible to get the current so regulated that it will spark across when the point is positive and not when the plate is positive. The point must always be positive in order to get a true spark, and must be so even when a tube is connected and the spark not actually in use as a spark. We shall come to this again later. We have here to add that the positive pole of the coil must always be connected to the *anode* electrode of the focus tube.

Focus Tubes—Penetration. Presuming the tube to be now working as it should, we will take the fluorescent screen and place an object between it and the tube. The object should be pressed gently but evenly against the screen itself, so as to avoid distortion. The tube being new and therefore "soft," its rays will have but little penetrating power and will show the object rather black. The rheostat on the switchboard is then moved one or two studs round from weak, when the light on the screen will be brighter and give a better picture. For full information on the handling of the focus tubes, see the chapter devoted entirely to them. The chapter in question relates in detail to the manipulation and selection for the various purposes.

Screen Examinations. When carrying out examinations it is always best to work in a room from which light is absolutely excluded. One should wait for a few minutes in the dark so that the eyes become accustomed. All extraneous light from the tube should be screened off by means of the protective box or by other means, such as the use of a black silk cloth, &c., and the diaphragm should only allow a pencil of rays to come out of the protective box just sufficiently large to cover the area to be examined. Always hold the screen as flat against the object as is possible, to avoid distortion. Use a medium hard tube for limbs and joints, and a hard tube for the deeper parts. Experience will soon teach the condition of tube required for the different parts.

Radiography. The whole secret of successful radiography lies in the correct judgment of the condition of the tube, which can only be acquired by practical work. As a general rule, however, it can be taken that for shoulder, knee, foot, elbow, wrist, &c., a medium tube is best. For pelvis, skull, chest, &c., one requires a harder tube: while for kidney, stomach, &c., a lower tube, as for all radiographs where the object be to secure a picture of muscular and tissue structure. One naturally requires a rather harder tube when dealing with a stout patient and so on, and in general the conditions vary so much that more than a mere guide cannot be given.

A radiometer is necessary for the accurate measurement of the condition of the vacuum of any tube, but as a useful guide one can make use of the "equivalent spark" as has been adopted for years. The cables connecting to the tube are connected by their other ends to the discharge rods of the secondary coil, the point of the rods being positive as previously referred to. When a tube is connected the current has a choice of jumping across the spark gap or passing through the focus tube, and always chooses the easiest path. Presuming the current to be sparking between the rods, they can now be moved further apart until the current prefers to travel through the focus tube, and just at this point it follows that the resistance of the spark gap and the resistance of the tube are practically the same. The distance of the spark gap in inches is spoken of as the "equivalent spark." It is only a crude measurement, but sufficiently accurate for practical work. With this in mind we might state that a "soft" tube has an equivalent spark of between 3 to 5 inches, a "medium" tube from 5 to 7 inches and a "hard" tube from 7 to 11 inches.

In general always place the object as flat on the X-ray plate as possible. For instance, in the case of a shoulder with the patient lying on the plate on top of a couch, place a cushion underneath his other shoulder so as to cause the object to set closer on the plate. In taking kidney under similar circumstances, let the patient lie with his knees up, thus forcing the back flat on the plate and so on.

The coated side of the plate must always be uppermost, that is to say against the body and facing the tube. The patient should remain as motionless as possible. When taking chest he should be asked to take a deep inspiration and hold it. Stomach is usually taken in the vertical position and then in the horizontal. For kidney cases, etc., it is always best to use some form of compressor when taking the radiograph from above, in order to avoid the movements of respiration. Such compressor may take the form of a cylinder attached to the tube box, or it may be a webbing band placed over the body and tautened by some mechanical means. If taking the radiograph from beneath the couch, the patient would be placed on his face and an air cushion placed beneath his body, the plate thus being against his back. In the first instance the patient would be placed on his back with the plate beneath, so that in either case the plate is placed to his back—an essential condition, as bringing the object closer to the plate.

Besides taking care that the object is always as flat to the plate as possible, one should always work with what is known as the incident ray, which is the ray that strikes the object at a true right angle. Various centring devices are made in order that this straight ray may be found. They consist usually of two wire crosses placed the one a little distance in front of the other, and the focus tube is adjusted by means of the various movements provided in the holder until the shadow of the one cross falls directly over the shadow of the other.

This avoids the distortion which must inevitably result from divergent rays striking the object. A cylinder diaphragm is frequently utilised in this same connection, serving also to screen off all secondary radiations which may otherwise detract from the sharp definition. It should also be borne in mind that the greater the distance of the plate from the focus tube, the less will be the distortion. As, however, the intensity of the X-rays is in inverse proportion to the square of the distance, it follows that distance cannot be increased to any very great extent, or exposures would become too long. The average distance from plate to focus tube is about 18 inches, which may be decreased somewhat for arms, legs, hands, or other thinner parts, or may be increased up to, say, 22 or 24 inches for deep parts such as chest, pelvis, etc.

In estimating exposures therefore, one has to know the degree of penetration of the rays and the distance from plate to anti-cathode, and, these two factors given, the actual exposure then becomes simply a matter of current intensity or milliamperage through focus tube multiplied by the number of seconds. Exposures are now universally spoken of as "milli-ampere seconds." Thus, in the case of a shoulder, if the plate be 18 inches from anti-cathode, and the tube be of a degree of hardness corresponding to 8 of the Wehnelt scale, the exposure would then be

80 milliampere-seconds, which signifies an exposure of 40 seconds with 2 milliamperes, or 20 seconds with 4 milliamperes, and so on.

On this basis it is possible to set down an Exposure Table which shall be of some practical utility to the beginner. There are of course, so many special conditions that come into the matter, that it is not possible to lay down hard and fast rules. Actual experience with one's own outfit and tubes is essential, combined with the exercise of good judgment. The following table will therefore only be taken as a guide, remembering always that if the tube be softer or the distance greater, that the exposure must be correspondingly increased. The exposure must also be increased for abnormal stoutness and so on. Above all one must learn to work each focus tube, no matter what its degree of hardness, to just that extent which signifies maximum efficiency, neither under-running nor overstraining. This point is dealt with fully in the chapter on Tubes.

		Penetration.		
Object.	Distance from plate to anti-cathode. Inches.	Wehnelt Scale.	Benoist and Bauer.	M.A. Seconds.
Skull, occipito-frontal	18	9–10	6–7	90
Skull, transversely	18	9–10	6–7	140
Skull, teeth (with film inside)...	15	8	5	15
Cervical vertebræ	18	8–9	5–6	70
Shoulder	18	7–8	5	80
Thorax	18	7–8	5	80
Lumbar region	18	8–9	5–6	180
Abdomen	22–28	8–9	5–6	75
Ribs	22	8–9	5–6	75
Knee joint	22	8	5	70
Femur	18	9	6	90
Ankle and foot	22	6–7	4–5	30
Wrist, hand	18	6	4	12
Stomach (Bismuth meal) ...	24	9–10	6–7	100
Kidney	18	6–7	4–5	180
Pelvis	24	9–10	6–7	200
Hip joint	24	9–10	6–7	150
Heart	24	9	6	45
Lungs, diagnosis of early tuberculosis	22	6–7	4–5	100

The above exposures are calculated without intensifying screen. If our screen as described on pages 222 and 223 be used, the exposures are reduced to about $\frac{1}{10}$th or $\frac{1}{12}$th.

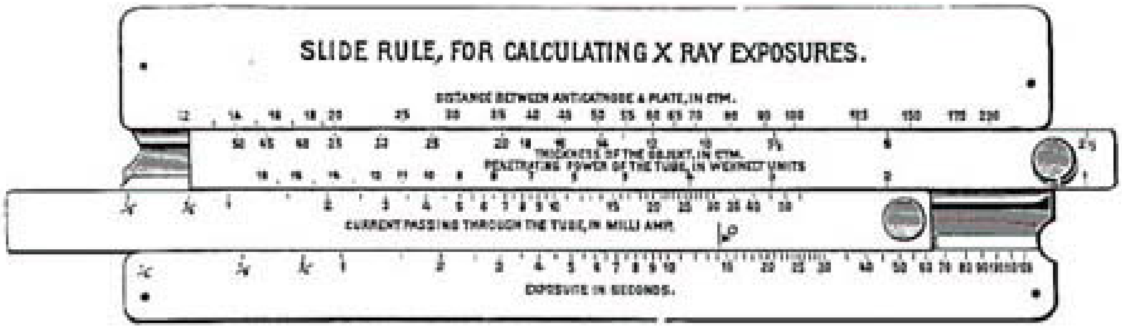
Rapid radiographs in one or two seconds, or even fractions of a second, are secured by powerful intensified coils of, say, 16" spark length running with centrifugal motor mercury interrupter, utilising a heavy primary current and in conjunction with a good heavy-anode tube that has been well trained up. After practical experience, and after becoming a thorough master over the peculiarities of his own outfit and his own focus tubes, the beginner will soon find that he is able to reduce exposures very considerably all round.

It is hoped that these few remarks may serve the beginner as a general guide, and a perusal of one of the excellent text books that are to be obtained should be read by him with all the greater interest and understanding. If this be done one may rely upon soon becoming a master of X-ray science.

Slide Rule for Calculating X-Ray Exposures.

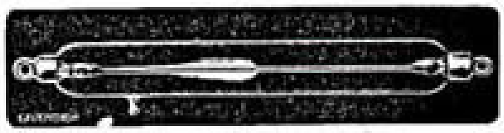
Price - - - £0 10 0

In white celluloid, with clear black lettering.


SLIDE RULE, FOR CALCULATING X RAY EXPOSURES.
DISTANCE BETWEEN ANTICATHODE & PLATE, IN CTM.
THICKNESS OF THE OBJECT, IN CTM.
PENETRATING POWER OF THE TUBE, IN WEHNELT UNITS
CURRENT PASSING THROUGH THE TUBE, IN MILLI AMP.
EXPOSURE IN SECONDS.

This is a very convenient little instrument for ascertaining the time of exposures, on the lines laid down above. The first scale signifies the Distance between Plate and Anti-cathode, the range being from 12 to 200 cm. The second scale of figures stand for the thickness of the object, with a range of between 2½ up to 50 cm. The third scale represents the penetrating power of the Focus Tube in Wehnelt Units, from 2 up to 18. The fourth scale represents the milli-amperage used and covers from 0.5 up to 50 milli-amperes.

The two slides are moved until the figures for the Distance, thickness, penetration and milli-amperage are opposite to one another, when the index on the second slide points to the number of seconds required for the exposure. These figures are on the fifth scale as shown in illustration, and cover a range of from ¼ to 120 seconds.



Oscilloscope for detecting reverse current described on page 217.

THE following Oscillograms serve to prove the statements we have set down in the reading matter in previous pages to the effect (1) that the several appliances comprising an outfit require to be made to work in harmony with one another to produce the best results. (2) That by constructing coil, interrupter and all other factors to suit one another, we have succeeded in reducing reverse current to a negligible quantity in practical work. (3) That the mere fact of working with a series resistance does **not** of necessity imply that reverse current is heavy—other factors exert far more influence in this respect.

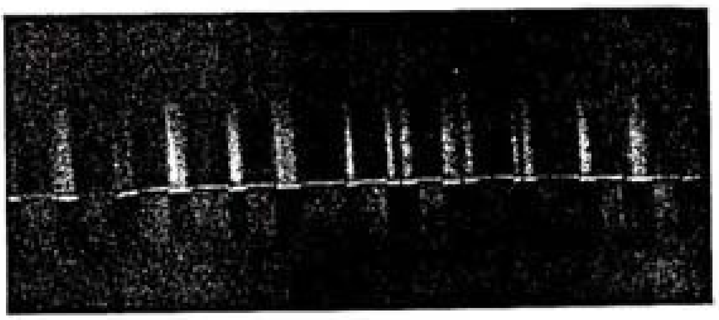


Fig. 1. This shows a badly adjusted outfit, with the several factors not working in harmony. The result is seen by great irregularity in the discharges and heavy reverse current.

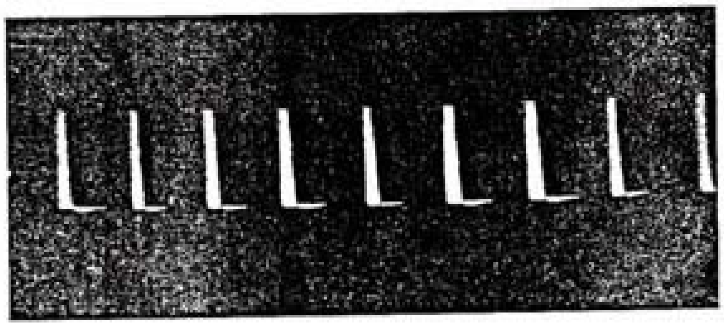


Fig. 2. This shows a 16 in. intensified coil, as page 189, with centrifugal motor mercury interrupter, as page 193, working from 240 volt main through a series switchboard, as page 196. The secondary terminals of the coil were connected to each end of the Oscilloscope tube, no resistance being in circuit, so that the secondary was actually short-circuited.

The result proves our claim that accurate adjustment of the various appliances comprising an outfit, viz., coil, break, condenser, etc., and taking the main voltage into due consideration has enabled us to reduce reverse current to the absolute minimum, quite negligible in practical work.

The photograph shows regular even discharges with the slightest trace of reverse current.

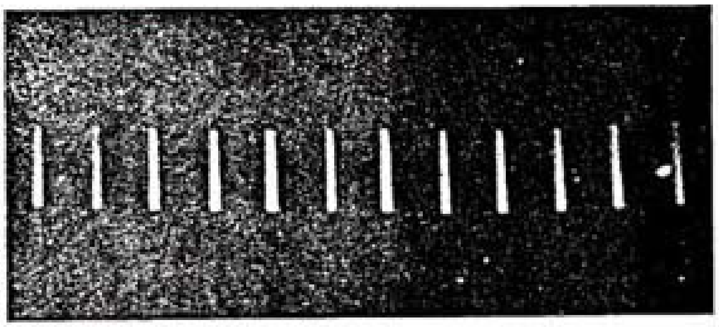


Fig. 3.—Taken under identical conditions as Fig. 2, with the exception that the Secondary of Coil was connected to an X-Ray Tube.

The photograph shows that the resistance of the vacuum tube has completely eliminated the weak reverse current shown in Fig. 2, no series spark gap, valve tube or rectifier of any description being placed in circuit.

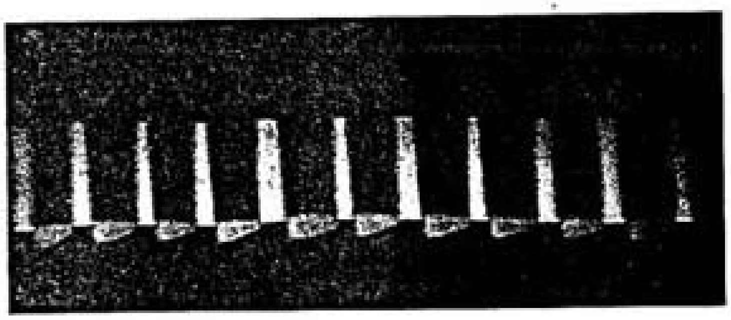


Fig. 4.—This photograph represents the same outfit as Fig. 2, working with a stronger primary current, and shows the reverse current set up by the idiosyncrasies of *some* Focus Tubes, as referred to elsewhere.

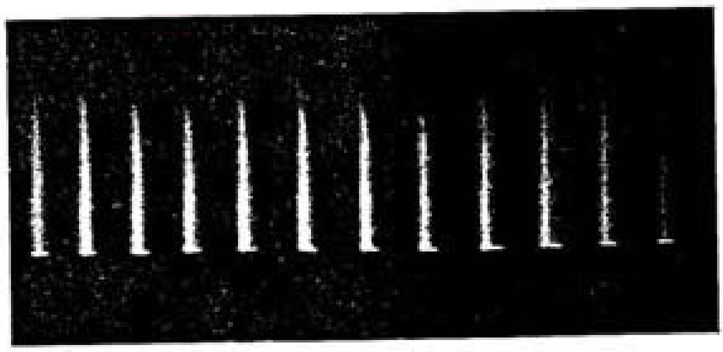
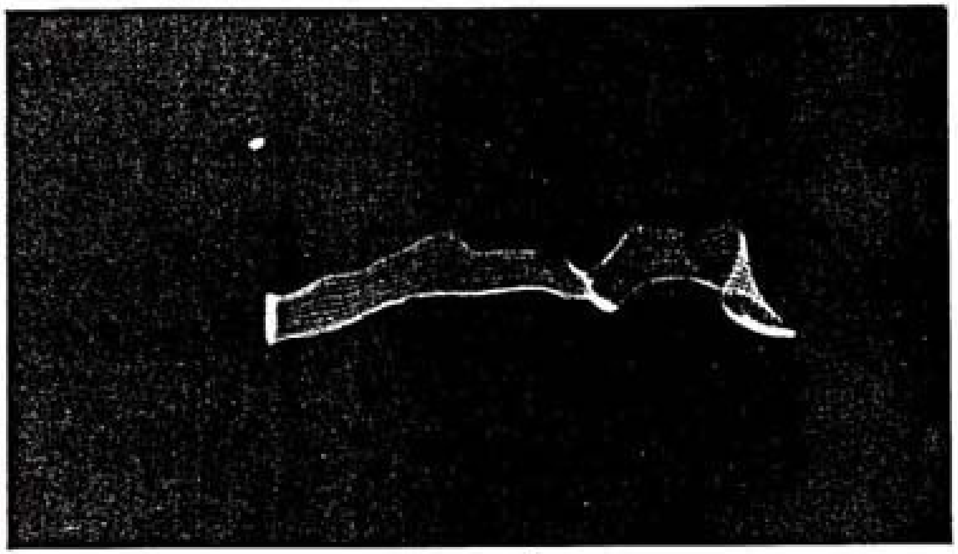


Fig. 5.—This shows the effect of a simple series spark gap, as referred to on pages 190 and 218, when introduced into the circuit under conditions as shown by Fig. 4. Although working with a still stronger primary current, it shows a regular even discharge, absolutely free from reverse. Valve tubes are only necessary when a much stronger reverse current has to be suppressed.

Oscillograms kindly taken for us by G. G. Blake, Esq., of Richmond.

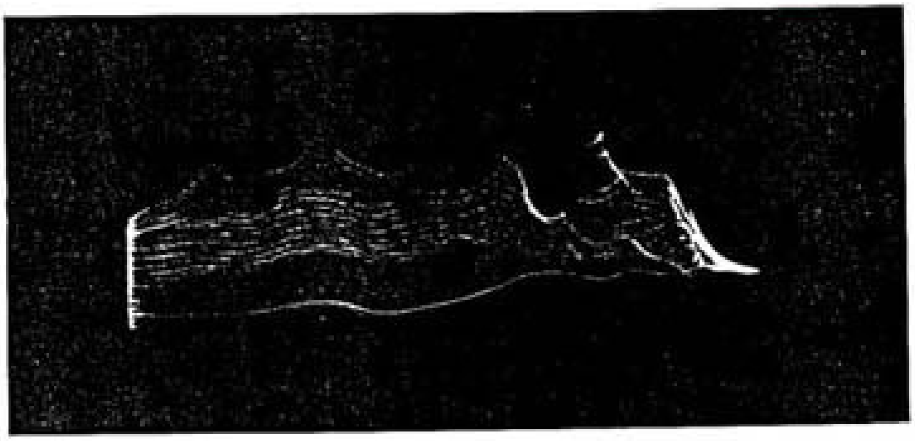


Rapid Radiography.

A single flash, which appears to the eye as a ribbon of flame, but which an excellent lens shows actually to consist of a dozen or more sparks all of equal value and traversing the same path, thus proving the very efficient and uniform working of the Interrupter and its great rapidity.

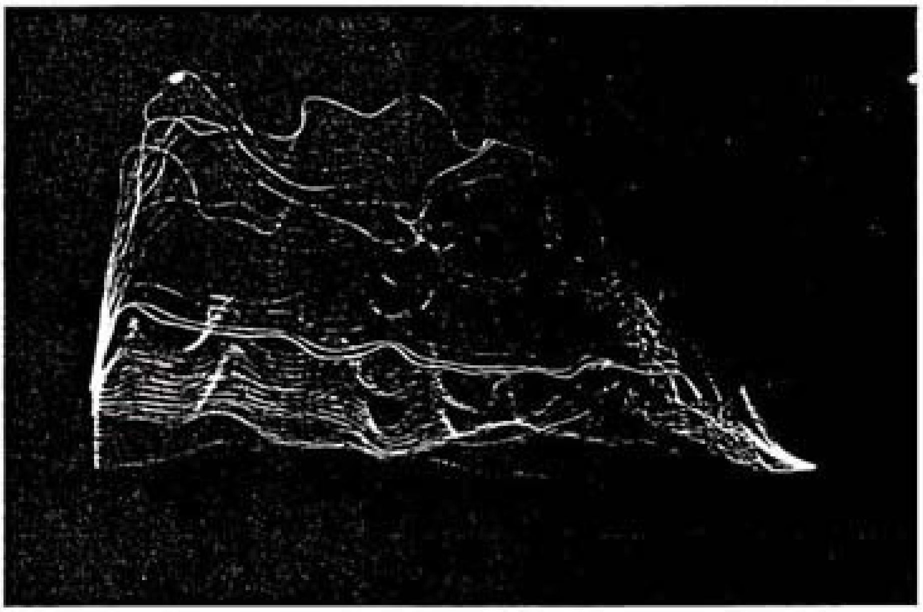
Taken with 16-inch Intensified Coil, as page 189, with Centrifugal Motor Mercury Interrupter, as page 193. On 240 volt main through Series Switchboard, as page 196.

Primary current 12 amperes. Secondary current 50 milli-amperes across 10-inch air gap.



Normal Radiography.

Taken with same outfit as above, but with only 6 amperes primary. Secondary current 20 m.a. across 10-inch air gap.



A discharge given by the same outfit as stated on previous page, showing great similarity to the discharge given by an Electrolytic Interrupter, but without the heavy Reverse current inseparable from the use of Interrupters of this type.

. . . . *Above all one must learn to work each Focus Tube, no matter what its degree of hardness, to just that extent which signifies maximum efficiency, neither underrunning nor overstraining.* (*Page 178.*)

Perfect Regulation

of the discharge from our Intensified Coils is obtainable, so that any Focus Tube can be worked to the utmost advantage, *i.e.*, the discharge can be exactly regulated to suit the vacuum of each individual Tube, that it shall give its best work.

By means of the Rheostats that regulate the primary current, the Rheostats that control the speed of the Interrupter-motor, and thereby the rapidity of the interruptions—in conjunction with the contact regulator of the Centrifugal Interrupter itself.

Perfect regulation between absolute extremes is secured in the most simple manner and by infinite degrees.

The Modern X-Ray Outfit.

Induction Coil. In years gone by induction coils were supplied of all spark lengths from 8 to 12 ins., and all sizes were purchased. They are still manufactured in all sizes, but, with very occasional exceptions, only two sizes are now purchased, viz., the 12-in. and the 16-in.

The actual distance between the secondary terminals of the 12-in. coil is 13½ ins., so that it is to all practical purposes a 14-in. coil, which spark length and more it will easily give. Such a coil will give results that cannot be excelled in any branch of X-ray work, and fulfils perfectly all requirements of the general practitioner and the electro-therapeutist. It is, of course, amply powerful enough for the best high frequency work, for which even a smaller coil suffices.

The actual distance between the secondary terminals of the 16-in. coil is 19½ ins., so that it is to all practical purposes a 20-in. coil, which spark length and more it will easily give. Such powerful coils are necessary for the best radiographic work in quick time. They are essential for instantaneous exposures and all very rapid exposures through deep parts, and accordingly they are now the standard with all X-ray specialists and the large hospital clinics.

Interrupter. We have long ago left behind us the old motor mercury jet and all such interrupters, no matter whether the di-electric used with them be gas, oil or anything else. The electrolytic interrupter also has no charms for us, as will be understood from the remarks on page 168. Our latest centrifugal motor mercury interrupter is the best ever invented, embodying the advantages and efficiency of the mercury interrupter with the rapidity and current carrying power of the electrolytic. The interrupter is altogether a new system, and must not in any way be considered in line with any other motor mercury interrupter, with which it has nothing in common except name. It is in use by all the leading X-ray workers of the whole world, and in all the large hospitals. References gladly given to those desiring independent expert medical testimony.

Switchboard. We have described our principle of switchboard construction very fully on preceding pages. Here we have only to state that the boards are specially made to suit each outfit, according to size of coil, the voltage of the main, the class of work intended, and so on. Perfect regulation is provided in every way, as to strength of current, rapidity of the interruptions, &c. The standard board is illustrated and its specification given on pages 195 and 196. The same board can be mounted up on ward trolley, on movable steel tables, in cabinets, or in any other manner desired.

Tube Stand or Couch. A protective focus tube stand, as illustrated on page 199, is most generally taken. This serves for radiography, screen examination and treatment, while providing protection to both operator and patient. In some cases, however, a couch is found necessary in addition. If a wooden top couch be taken it serves to place the plate upon, providing a flat even surface so that it will not get broken when the patient lies upon it. The exposures are then made from above by means of the protective tube stand.

Where it is desired to examine the patient with a screen either solely for examination or for localising the exact area to be radiographed it follows that the tube must be beneath the couch, and, moreover, that the couch must have a canvas top. The tube is contained beneath in a protected box, allowing necessary adjustments. Radiographs can also be taken from above by means of the tube stand as in the other case.

Couches have been made in a great variety of patterns, but mostly to fulfil some definite purpose. Our own standard pattern as per page 207 is designed for all-round work. It is sound, simple and efficient. Any other pattern can be built to order on receipt of requirements.

Focus Tubes. Focus tubes to work with a modern outfit require to be much better and more solidly constructed than the earlier types. The very large and elaborate modern tube bears very little resemblance to the small and weak types hitherto in use. The first essential is that a tube should be fitted with a "heavy-anode," that is to say a heavy or strong anti-cathode. The anti-cathode must be very solid, and usually consists of a platinum surface backed by massive copper. The mass of copper is designed to carry away the heat as much as possible. Tubes with only a light target are useless to withstand the intense discharges of the modern coil and interrupter. The handling of focus tubes and the recognised principles are set forth fully elsewhere.

Fluorescent Screen. The fluorescent screen requires to be of the highest class if the brightest and clearest pictures are desired. The barium platino-cyanide salts require to be very evenly coated, and also must be very fine so as to avoid grain markings. Every screen should be fitted with a lead glass plate, which affords protection to the face of the operator and at the same time guards the screen itself from dust and damage. In many cases the screen is also fitted with a pair of metal handles for convenience in handling, each handle having a protecting plate of lead to protect the hands. The usual size taken is 12 by 9½ ins. which is large enough for all purposes and convenient to handle. For examination in daylight a fluoroscope becomes necessary, but it is much better to use a darkened room, in which one should remain for some minutes first in order that the eyes shall become accustomed. It is recommended by some that the operator should burn a ruby incandescent lamp for a short while on the presumption that the green fluorescence of the screen then appears brighter in contrast.

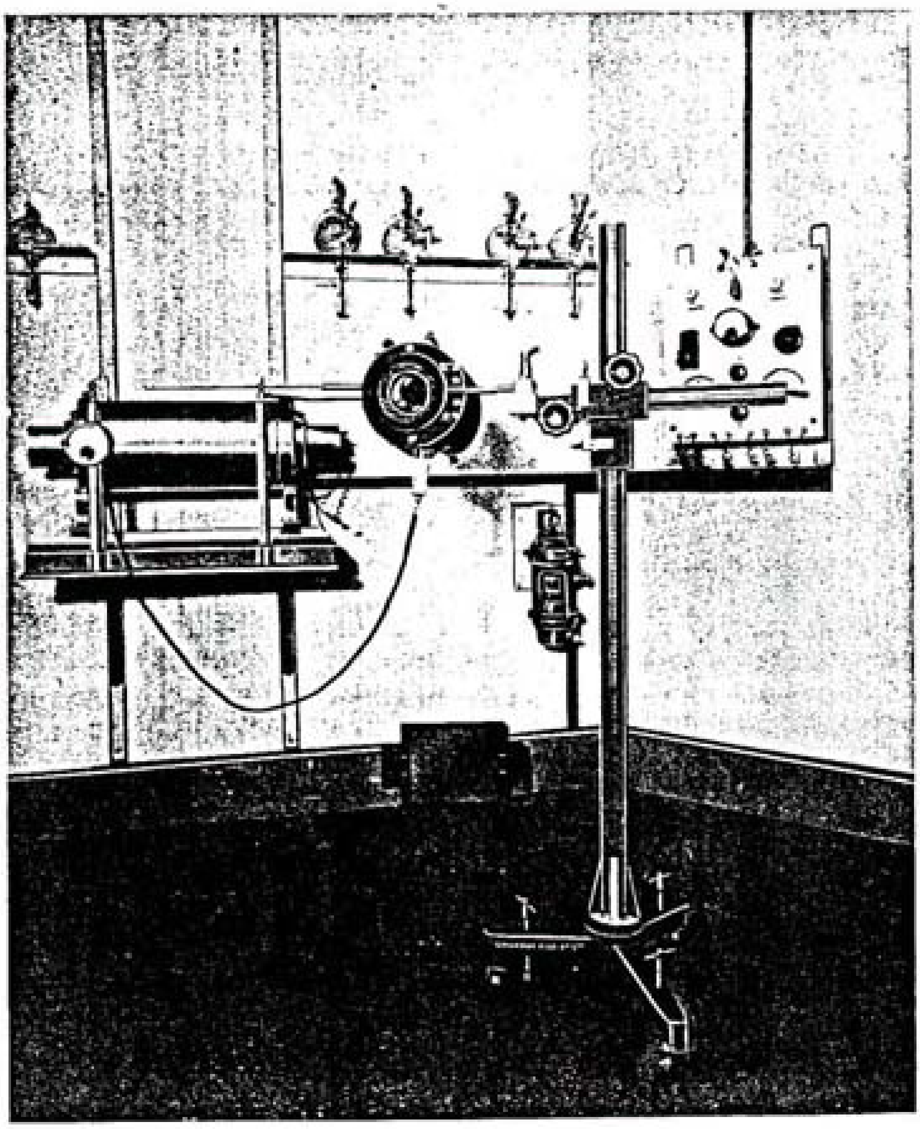
Milli-ampere Meter. This is now always adopted to measure the amount of current passing through the tube itself, serving as a guide for exposure in radiography, indicating the condition of the vacuum of the tube, and serving also for therapeutic treatment.

Apron and Gloves. If working with the rays to a considerable extent it is always advisable to make use of these notwithstanding the fact that the tube itself may be enclosed in a protective box. They are now made much lighter and more flexible than hitherto, and do not prevent efficient manipulation or cause inconvenience in any way.

High tension cables for connecting from coil to focus tube, flexible cables for connecting up together the various appliances comprising the outfit, complete the essentials of an installation. Accelerating screens, radiometers and other such smaller accessories are not absolutely necessary. They are all illustrated and described in the following pages.

Cavendish X-Ray Outfits

Are supplied with Coil, Switchboard, &c., built up to any form desired.



A Specimen Outfit

Comprising 16 in. Intensified Coil on base with condenser, and milli-ammeter: Centrifugal Motor Mercury Interrupter: Controlling Switchboard; Protective Tube Stand, with Iris diaphragm: Screen, with lead glass plate and protective handles, connecting cables, &c.

Cavendish X-Ray Outfits.

Outfits can be built up to any form desired, and can be composed of any appliances that may best fulfil individual requirements. Prices and full particulars gladly furnished on receipt of specification, or advice and recommendation given if conditions and wishes are stated.

The following is a typical estimate of outfit as illustrated on previous page. Any of the items can be deleted or modified to meet individual requirements, using this estimate as a basis.

To work from continuous current 120 to 250 volts.

	Order No.			
1 16 in. Intensified Spark Coil, on base with condenser, and with discharge rods mounted on separate pillars	9038	... £42	0	0
1 Centrifugal Motor Mercury Interrupter, with mercury ..	9100	... 10	10	0
1 Controlling Switchboard, 120-250 volts	9140	... 12	10	0
1 Protective Focus Tube Stand	9250	... 7	10	0
1 Radiolgie Focus Tube	9604	... 3	15	0
1 Heavy Anode Focus Tube	9082	... 2	12	6
1 X-ray Milli-ammeter	9904	... 3	5	0
1 Fluorescent Screen, 12 by 9½ inches	9788c	... 4	12	0
1 Sheet Lead Glass, to fit fluorescent screen	9789c	... 0	6	6
1 Pair Handles with protective plates for above screen ...	9790	.. 0	7	0
1 Pair High Tension Cables	9970	... 0	9	0
1 Set Flexible Connecting Cables...	9990	... 0	15	0
		£88	12	0
1 Protective Apron	9460	... £3	0	0
1 Pair Protective Gloves	9470	... 0	18	0

Iris Diaphragm and other accessories for the Tube Stand according to requirements. Listed page 199.

The same outfit as above, for continuous current up to 120 volts, £86 12 0, being a reduction of £2 0 0 in respect to the switchboard.

Same Outfit with 12 in. Coil (No. 9034).

Up to 250 volts ... **£73 12 0.** Up to 120 volts ... **£71 12 0.**

Intensified Spark Coils.

TECHNICAL CONSTRUCTION.

In every detail our coils are of the very highest class. Only the very best material is employed, and the greatest care is taken in every stage of their manufacture. The secondary wire is double silk insulated and is wound upon a porcelain tube, this constituting the very finest insulation. Outside, the secondary coil is surrounded by a polished ebonite cover, and the two shaped end-cheeks of the coil are of **massive solid ebonite**.

The primary coil is wound with the best insulated wire and is wound round an iron core of the best quality. It is covered outside with insulating tape and then the whole enclosed in a **massive polished ebonite tube** of more than ¼ in. thickness. **This primary tube is completely removable from the secondary.** This enables the coil to be handled more conveniently and also permits a primary coil wound for a different voltage to be used with the same secondary, so that should the coil be required to work on a different main at any time it is a very simple and inexpensive alteration. It will thus be understood that between the primary and secondary wires there is a massive ebonite tube, a porcelain tube and other insulation. Compare these statements now with other coils—they are made with the primary fixed inside the secondary, which means that any repair or alteration necessitates the dismantling of the whole coil. In some cases the secondary coil is wound direct on the primary coil, there being no insulation between the two coils other than the silk—and often only cotton—covering of the wires. When it is remembered the enormous voltage that comes into question it will readily be understood why it is these coils so often "spark through" between primary and secondary. When this occurs it invariably means that some sections of the secondary are completely burnt out, necessitating a very expensive and difficult repair. We do not know of any other coil provided with ebonite cheeks to the secondary—they are all of black polished wood to represent ebonite. Obviously the ebonite is of advantage, and it is equally obvious that the wooden cheeks effect a saving of some three or four pounds per coil.

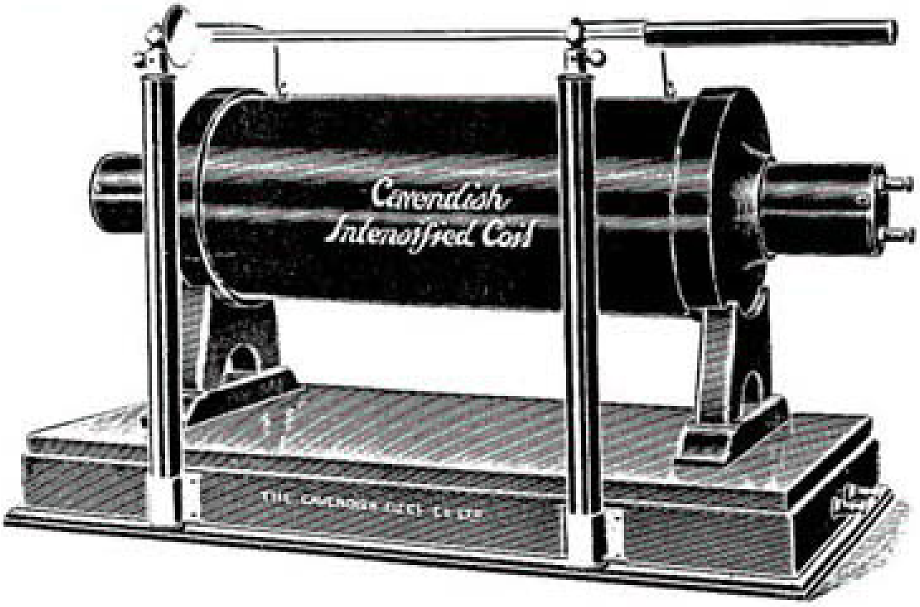
As we are only supplying coils of the very highest class, we naturally do not in any way attempt to sacrifice efficiency for the sake of effecting a saving in cost. Even so, our coils are no more expensive than those of other makers, and in many cases are cheaper. This is, of course, only possible when one has had long experience, specialising in this branch of X-ray equipment.

All our coils are wound on the latest approved **multiple section principle.** In every respect their design, construction and finish is of the best. Mounted upon their polished wood bases—the usual mounting and recommended—or mounted upon white marble switchboards or in any other way, they present a very handsome appearance.

They represent the result of many years' experience in the construction of large spark coils for X-ray work, and in conjunction with our centrifugal motor mercury interrupter they constitute the perfect high tension generator. We should always be very pleased to place our coil and interrupter in comparision with the coil and interrupter of any other maker, confident that the combination cannot be excelled in any respect.

Cavendish Intensified Spark Coils.

Our new Intensified Spark Coils are constructed to meet the essential modern requirements in relation to short exposure radiography. They are capable of giving the most intense discharges as will be gathered when we state that 80 or more milli-amperes are easily obtainable across an 8 in. air gap by a 16 in. coil working with our Centrifugal Motor Mercury Interrupter. This output enables instantaneous radiographs (one-hundredth second) to be taken of the heart and all other parts with the exception of pelvis. As a general rule nothing is gained by taking a radiograph instantaneously, but everything is gained so long as the pictures can be taken in one or two seconds. At the same time it is essential that perfect control shall be obtainable, that the discharge from the coil can be regulated down to moderate power for ordinary time radiographs and screen examinations and to weak discharges for working soft tubes as in therapeutic treatment. In conjunction with our Centrifugal Motor Mercury Interrupter all these conditions are complied with.



Cavendish Intensified Spark Coils.

Mounted on finely polished oakwood base, with necessary condenser inside base. For working with our Centrifugal Motor Mercury Interrupter or any other type of mercury interrupter.

With point and plate discharge rods mounted on the large ebonite terminals of the coil.

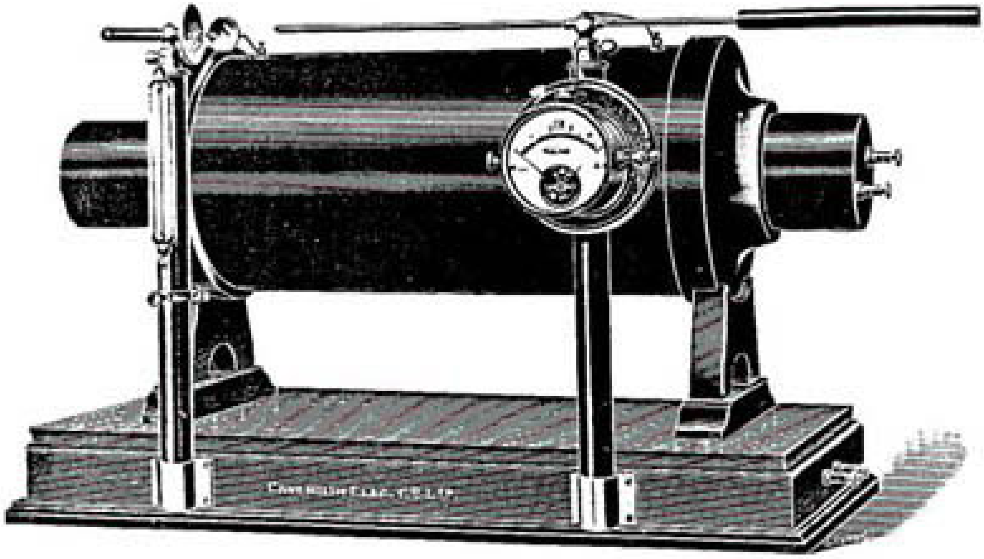
Order No.	Spark Length.	Price.		
9000	8 in.	£18	0	0
9002	10 ,,	21	0	0
9004	12 ,,	26	0	0
9006	14 ,,	34	0	0
9008	16 ,,	41	0	0
9010	20 ,,	60	0	0

With point and plate discharge rods mounted on separate pillars as illustrated above.

Order No.	Spark Length.	Price.		
9030	8 in.	£19	0	0
9032	10 ,,	24	0	0
9034	12 ,,	27	0	0
9036	14 ,,	35	0	0
9038	16 ,,	42	0	0
9040	20 ,,	61	0	0

The mounting of the discharge rods on separate pillars as illustrated is much more satisfactory, being much stronger and more convenient. If only mounted on the ebonite terminal of the coil the long rod swings round and the movement of the rod is not smooth and even through the terminal. The rod is graduated in inches with the O against the right hand pillar when spark gap is closed, so that as the rod is drawn to the right the actual spark gap in inches is seen at a glance. This gap represents the equivalent spark of the focus tube as referred to in the reading matter on preceding pages.

Cavendish Intensified Spark Coils.



The illustration above shows a convenient method of mounting the Milli-ampere Meter, and an Oscilloscope Tube. If ordered at the same time as the coil, the milli-ammeter and oscilloscope will be mounted in this manner without extra charge, a remark which applies to either one or both. The milli-ammeter is listed under Order No. 9880 and costs **£3 5 0.** The oscilloscope tube is listed Order No. 9890 at **15s. 0d.** Coils must be as Order No. 9030-9040.

If desired a little **series** spark gap can be arranged between one pillar and one terminal of the coil. In this case the terminal of the coil is modified to take the form of a small plate, while a sliding point or rod is made to work through a hole in the metal fitting on the head of the pillar. Such a **series** spark gap is all that is necessary for suppressing the little reverse current which is sometimes set up by the peculiarities of certain focus tubes. Extra **10s. 0d.** See page 181.

Cavendish Intensified Spark Coils.

If the coil is intended to work with an electrolytic interrupter it is necessary to have a variable primary coil. Three variations are sufficient, and they consist in switching the windings of the primary in "Series," "Parallel" and "Series-Parallel." These different degrees of self-induction are best controlled by a crank switch on the switchboard, which requires to be manufactured accordingly. If intended only for working with an electrolytic interrupter there is no necessity for a condenser, but if the coil be intended for use with both mercury and electrolytic interrupters, then a condenser becomes necessary.

With Condenser.

Order No.	Spark Length.	Price.
9060	12 in.	**£29 0 0**
9064	16 ,, ...	**44 0 0**
9068	20 ,, ...	**63 0 0**

Without Condenser.

Order No.	Spark Length.	Price.
9080	12 in.	**£25 0 0**
9084	16 ,, ...	**39 0 0**
9088	20 ,, ...	**57 0 0**

If with discharge rods mounted on separate pillars as per previous page **£1 0 0** extra. If arranged with series spark gap as referred to above, total increase **£1 10 0.**

Any coil insulated with specially hard wax for tropical climates 5 per cent. extra.

Centrifugal Motor Mercury Interrupter.

This Interrupter marks a great advance on the previous types of motor mercury dipper and jet interrupters as has been fully explained in the reading matter on preceding pages. By reason of the principle of working, the rapidity of interruption is very great, approximating to that of the electrolytic break. At the same time its construction enables it to pass very heavy currents, which fact, combined with its enormous rapidity, marks it as the ideal interrupter for rapid radiography.

This interrupter in conjunction with a 16 in. intensified spark coil will easily give 80 and more milli-amperes across an 8 in. air gap as measured by a D'Arsonval dead-beat moving-coil milli-amperemeter of the highest class. This enormous output is obtained with only about 12 amperes primary current, which is a very moderate consumption as universally used. Such intense discharges are only otherwise possible by the use of an electrolytic interrupter and 60 or more amperes primary current. These heavy discharges permit of instantaneous radiographs in one-hundredth of a second of the heart and all parts of the body except pelvis.

The interrupter is equally efficient for use with medium currents for ordinary time exposures and screen work, and will break equally well even the very weak currents, say ½ an ampere, such as are used with soft tubes for therapeutic treatment. By means of a simple regulating rheostat in circuit with the motor of the interrupter the rapidity of interruption can be regulated down to a few hundred per minute, still working efficiently, so that on the score of rapidity and current carrying capacity the interrupter is absolutely flexible.

Regulation.—The general principle of the interrupter and its advantages has been dealt with fully on preceding pages, but we would here make mention of a regulating adjustment which is provided. By simply lifting up and turning the milled ebonite knob on the top of the interrupter it is possible to move the revolving segmented disc so that it just lightly engages with the revolving ring of mercury or plunges deep into it. This permits regulation of the amperage passing through the primary circuit, and is a regulation to be used in conjunction with the primary rheostat on the switchboard.

Efficiency.—The efficiency of the interrupter between extreme limits, that is to say for all kinds of work, is unequalled as has been clearly shown above and also on the pages devoted to Intensified Spark Coils. Mere efficiency of itself however is not everything, as it is essential that such efficiency be maintained. This point brings us to the question of the

Cleaning of the Mercury.

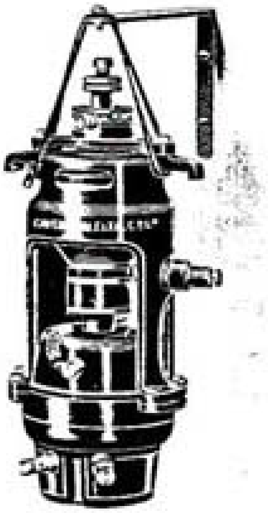
In the earlier types of mercury interrupter, no matter on what system, the mercury rapidly became muddified by use, with the result that the starting efficiency could not possibly be maintained. For instance in the case of all the jet interrupters, when the mercury became dirty the pump could not feed so well, with the result that the mercury jets were weaker and of unequal strength. This means that the interruptions were unequal, producing flickering in the tube and of course absence of efficiency.

With our new centrifugal interrupter the very principle of construction ensures the mercury remaining clean for many months, even for twelve months or longer. The di-electric used in the interrupter is ordinary paraffin oil. On the well-known principle of the centrifuge, it follows that when the bowl be rotated at great speed that the mercury will always sort itself out from the paraffin, being of totally different s.g. Being the heavier liquid by far, it follows that the mercury will take its position against the side of the steel bowl, forcing the paraffin to take its position just to the inside of it. Thus the mercury naturally takes its place exactly where wanted, and as the make and break takes place on the inside edge of the mercury ring it also follows that the paraffin is likewise in the exact position required for drowning the sparking. Since the mercury must always separate itself from the paraffin, it is clear that the mercury will always remain clean, that is to say for many months at a time. The emulsification of the mercury is so gradual that we have known these interrupters run even for twelve months without cleaning. As the quantity of mercury very slowly diminishes by reason of the small quantity imprisoned in the fatty parts of the paraffin, which in time settle down in the interrupter bowl, so this reduction can be nullified by the simple means of moving the regulator referred to above, whereby the segmented disc is brought further over to the side of the bowl to meet the mercury. In any case a teaspoonful of mercury added every few months will keep the interrupter working at highest efficiency. The paraffin di-electric should never be allowed to become deficient in quantity.

For the reason that the mercury remains always metallically pure, and for the reason that the disc can always be moved further over to meet the mercury should its quantity appreciably diminish, it is evident that its wonderful efficiency is constant. The interrupter will produce identical results six months or more after use as the day on which it was first installed. The actual quantity of mercury used in the interrupter is ten ounces (weight) and paraffin five fluid ounces.

The interrupter is in use throughout the whole world by all the leading X-ray workers and by all the large hospitals, and has given the greatest satisfaction in every case. It will improve the output of any coil beyond recognition, but its greatest efficiency is only possible where the coil, the condenser and other factors are in harmony. As we have mentioned in our few remarks regarding our intensified spark coils, the interrupter and coils are specially constructed to suit one another taking every factor into due consideration. Together they constitute the ideal combination. The accuracy with which the coil and interrupter are suited to one another is clearly proved by the fact that an oscilloscope tube placed in circuit will betray no reverse current whatsoever with any air gap exceeding an inch. Since no X-ray tube has such a low resistance as to be equivalent to an inch air gap, it follows that the reverse current is reduced to a negligible quantity altogether. This is perhaps the most important condition of all, which will be fully understood after perusal of our remarks on reverse current, which occur in the description of "focus tubes."

In this same connection see reproduction of Oscillograms on pages 180 *to* 183.



Centrifugal Motor Mercury Interrupter.

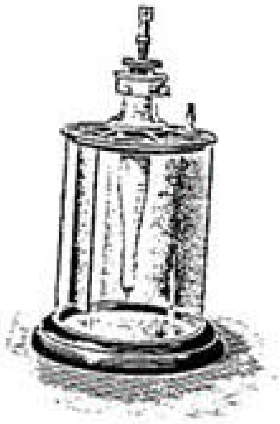
With motor wound for any voltage continuous current from 12 volts (accumulators) to 250 volts. Complete with the necessary small quantity of mercury.

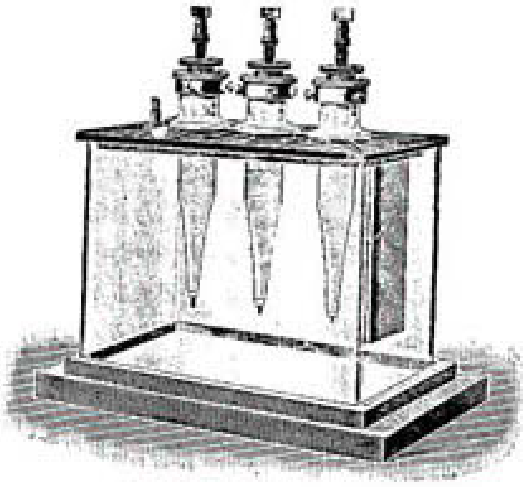
Order No.		
9100	(Please state voltage for motor when ordering)	£10 10 0
9110	With motor wound for alternating current main	12 10 0

Please state voltage and periodicity. In this case, of course, the interrupter proper and coil would be worked from accumulators.

Any voltage can be passed through interrupter proper, so that if necessary the motor can run from the main and the interrupter proper (and coil) from accumulators. This is an advantage for those possessing low voltage coils working with accumulators as it saves unnecessary consumption.

Wehnelt Electrolytic Interrupters.





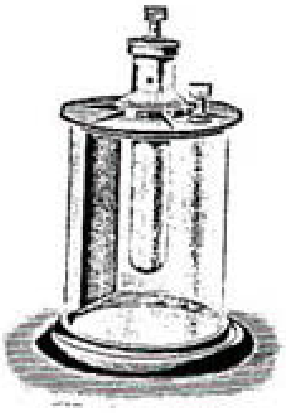
Order No.				
9115	Wehnelt electrolytic interrupter with 1 platinum point of 1 mm. diameter, with screw adjustment to control the length of point exposed. With two terminals for connection	£3	0	0
9116	Same, but with platinum point 2.5 mm. diameter	4	0	0
9117	Same, but with 3 platinum points, one of 1 mm. diameter and two of 2.5 mm. diameter, each with independent screw adjustment and terminal	9	10	0
9118	Same, but with 3 platinum points, all of 2.5 mm. diameter. This is the interrupter used for instantaneous radiography, all three anodes being then worked in "parallel."...	10	10	0

These interrupters work with sulphuric acid. Regulation is effected by the extent of platinum point exposed, and choosing a thin point for weaker currents and a thick point for heavy currents. In all cases the coil requires to be specially made to suit them, that is to say, with a variable primary coil. They only work satisfactorily with a low voltage in the neighbourhood of about 80 volts, so that a shunt board is essential on high voltage mains. A general description of these interrupters occurs in the reading matter at the commencement of this section of catalogue.

Prices subject to fluctuation of the platinum market.

Any pattern quoted for on request, with platinum points as above or with other combinations of thin and thick. Also with Silencers, &c.

Simon Interrupter.



Order No.				
9120	Simon interrupter, single tube ...	£2	5	0
9121	" " double tube ...	2	17	6
9122	" " triple tube ...	3	14	0

Simon interrupter, regulating type, provided with a larger opening at the bottom of the tube, with a porcelain cone which can be adjusted in the aperture to reduce or increase its working section to provide regulation.

9124	Single tube	£4	12	6
9125	Double tube	5	19	6
9126	Triple tube	7	5	6

Specification of our Boards.

White Marble Board provided with primary rheostat allowing perfect regulation of the amperage passing through the spark coil. Rheostat handle of strong construction and nicely lacquered with laminated copper contact spring. With crank rheostat of similar type for regulating the speed of the motor of interrupter and thereby the rapidity of the interruptions. These two rheostats, in conjunction with one another, provide perfect control from the very weakest to the very strongest currents for all classes of work, enabling each focus tube to be run to the very best advantage without overstraining.

Amperemeter to measure the current passing in primary circuit reading 0–15 amperes or 0–30 amperes, or other reading to suit the particular conditions. Of best moving coil, dead beat type, of utmost precision. Finely lacquered brass case and of about 1½ ins. diameter. Mounted on finely lacquered brass pillars.

Switch for primary circuit and switch for motor of interrupter. Best type china fuse for primary circuit and for motor circuit.

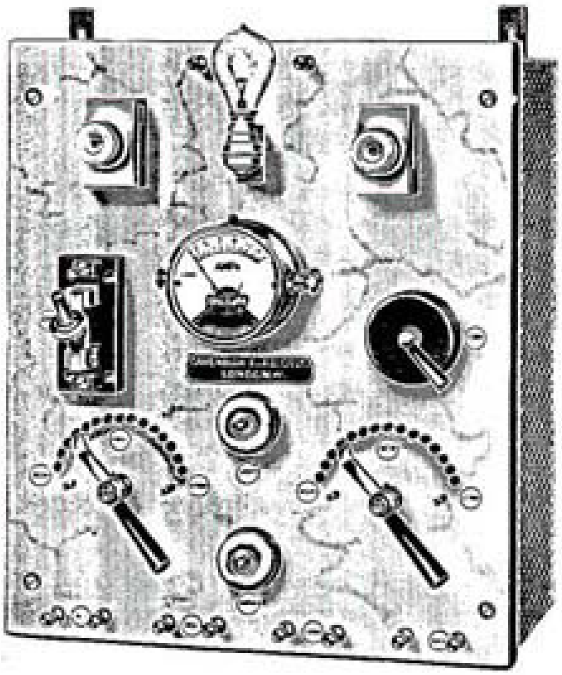
Incandescent lamp at top of board, with a separate switch to control same. Very convenient when working in a darkened room.

Terminals.—Two for the main at top of board, and two each to connect respectively with spark coil, condenser, interrupter and interrupter motor, so that it is only necessary to connect twin wire between the different points to have the whole outfit connected up. No arrangement could be more simple and all terminals and other fitments are clearly labelled.

Resistance Coils of the best resistance wire are suspended at the back of the board in an iron frame on porcelain insulators, covered in by perforated zinc.

The whole of best design, make and finish, and all fitments used of the highest class. An absolutely efficient and reliable board, free from all complication and very simple and convenient for manipulation.

X-Ray Switchboards.



As specification on preceding page, and as referred to on pages 170 to 172.

Order No.		
9130	For any voltage from 50 to 120 volts	£10 10 0
9140	,, ,, 120 to 250 ,, ...	12 10 0
	If fitted with pole-reverser for reversing the direction of the current through the focus tube, obviating the necessity of changing the connecting wires, with insulating cover (Fig.) extra	1 0 0

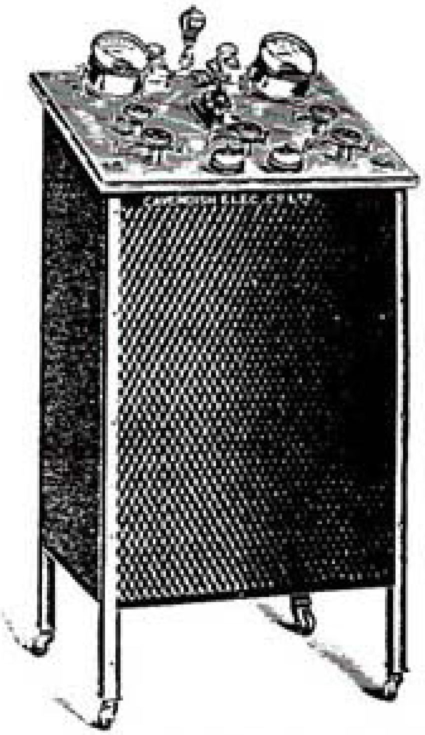
Shunt Switchboard, same style as above, but with an **additional** crank rheostat enabling the **voltage** through the coil to be varied. The usual crank rheostat serves for regulating the **amperage** through the coil independently of the voltage. See remarks on page 172. When used as a series board these two rheostats work in conjunction with one another, the one providing coarse regulation of the amperage and the other fine regulation. A switch to change over from series to shunt is also fitted.

These boards are thus equally efficient both as series and shunt resistances, fulfilling all conditions perfectly.

Order No.		
9150	For any voltage from 50 to 120 volts	£13 0 0
9160	,, ,, 120 to 250 ,, ...	15 0 0
	If fitted with voltmeter to measure the voltage passing through primary coil, of best type, in lacquered brass case to match the ampere meter ... ... extra	1 10 0
	If fitted with pole-reverser ... ... ,,	1 0 0

X-Ray Switchboards.

The Trolley Switchboards first introduced some ten years back have recently returned to favour, and are now very frequently purchased. The chief advantage which they offer is that of enabling the regulations to be carried out while standing by the side of the patient, as when making a screen examination. In many cases, too, the fact of their not being a permanent fixture on the wall is a consideration.



Switchboard exactly as specified under Order No. 9130, but mounted up on table on castors, as illustration above.

Order No.			
9170	For any voltage from 50 to 120 volts		£14 10 0
9180	,, ,, 120 to 250		16 10 0
	If fitted with pole-reverser	extra	1 0 0

Shunt Switchboard exactly as specified under Order No. 9150, but mounted up on table on castors, as illustration above.

Order No.			
9190	For any voltage from 50 to 120 volts		£17 0 0
9200	,, ,, 120 to 250 ,, ...		19 0 0
	If fitted with voltmeter to measure the voltage passing through primary coil, of best type in lacquered brass case to match the amperemeter	extra	1 10 0
	If fitted with pole-reverser	,,	1 0 0

The illustration actually represents Order Nos. 9190 and 9200, with voltmeter, and fitted in addition with 2 Crank Switches, the one to change over from Mercury to Electrolytic Interrupter and the other to control the switchings of variable primary coil.

Protective Focus Tube Stand.

A great variety of Protective Tube Stands have been brought out of recent times, but mostly they are very large and expensive appliances, costing in the neighbourhood of £25. Such stands have little to claim over the lighter and more simple type as here illustrated, and, although perhaps they may appeal to certain workers for specific requirements, nevertheless they are not to be preferred in a general way.

Compared with the massive and complicated apparatus we have referred to, the pattern we are listing is of simple type. As shown by the illustration, it is provided with a heavy iron foot on castors and fitted with three clamping screws so that it may be fixed to the floor rigidly when desired. The vertical pillar is of oakwood as also is the horizontal arm carrying the protective box.

The protective box is a distinct improvement on the other patterns, being made of **compressed papier mâché** lined inside with leaded rubber material for protection. Inside the box are three rubber knobs for the focus tube to rest against, being held in position by two straps. There are **no metal parts** or screws, &c., inside the box as invariably occur with the other patterns which are constructed of wood. Such metal parts cause sparking round the tube and are a fruitful cause of perforation.

The protective box is attached to the horizontal arm by means of a ball joint so that it may be turned to any angle. The vertical and horizontal adjustments are effected by **two rack and pinion movements** with engraved scales. The scale on the horizontal arm is of use for **stereoscopic work,** enabling the box to be moved a given distance in either direction. Fixing screws are provided for firmly fixing the movements in the desired positions.

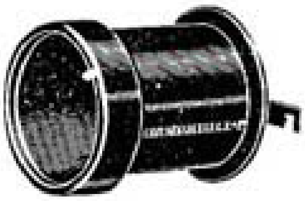
Accessories.—With the stand are included 3 plain metal diaphragms with apertures of about 1, 2 and 3½ in. respectively. If desired, an **Iris diaphragm** can be taken, exchangeable with the others.

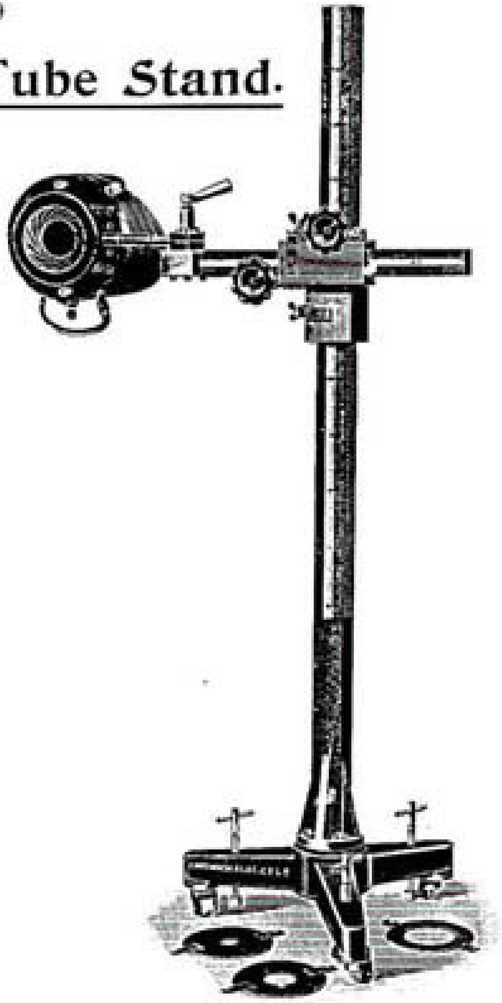
A Compressor Cylinder can also be attached in the same way as the diaphragms, for compression of the body when radiographing kidney, &c., in order to obviate the movements of respiration. Also of value in screening off the secondary rays, which cause distortion of the image and spoil the definition and contrast.

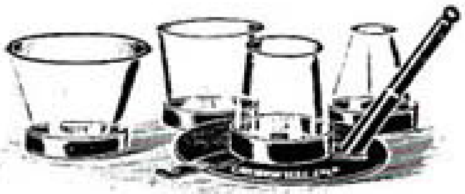
Lead Glass Specula of different sizes may also be utilised by means of the different adaptors.

The stand is therefore of exceptional all-round utility, equally convenient and efficient for **Radiography, Examination, Treatment and Compression.**

Protective Focus Tube Stand.



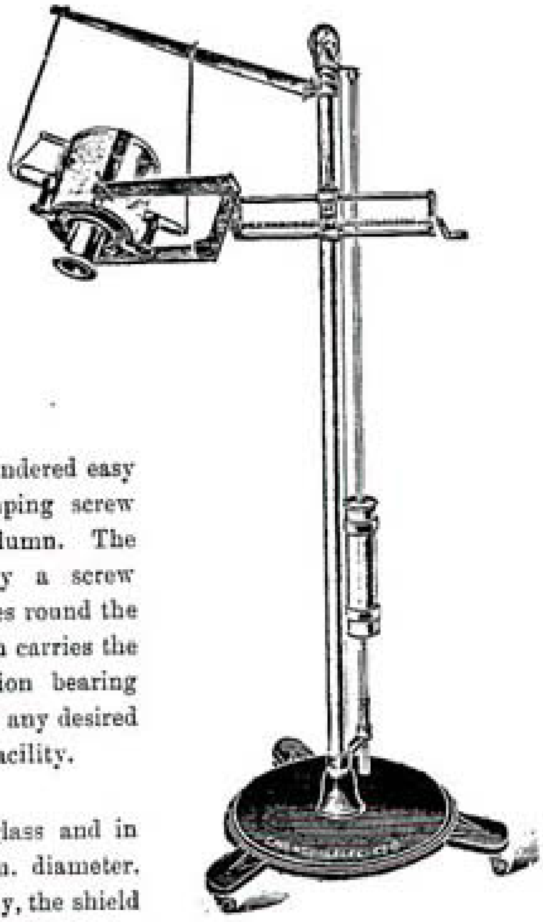




Order No.		£	s.	d.
9250	**Protective Focus Tube Stand,** as described, including 3 plain metal diaphragms with apertures of about 1, 2 and 3½ in. (Fig.)	£7	10	0
9254	**Iris Diaphragm** to fit stand, interchangeable with plain diaphragms. In polished ebonite mount (Fig.)	1	15	0
9258	**Diaphragm with Compressor Cylinder** permanently attached, fitting to stand in same manner as the other diaphragms. Cylinder about 6½ in. in length by 4½ ins. diameter	0	10	6
9262	**Diaphragm with Holder for Sabouraud Pastilles,** sliding through a tube, and permitting the pastille being exposed at any distance from 6 to 12 cm. from anti-cathode. Graduated in centimeters. With bayonet fitting to carry the large lead glass specula as used for ringworm, &c.	1	2	6
9266	**Large Lead Glass Specula,** with metal mount to fit the above diaphragm. For ringworm and general treatment. (a) 1 in. diam. ... **5s. 6d.** (c) 3 in. diam. ... **6s. 6d.** (b) 2 „ „ ... **6s. 0d.** (d) 4 „ „ ... **7s. 0d.**			
9280	**Adaptor** to fit into Diaphragm No. 9262, to carry the small lead glass specula listed under Order Nos. 9430 to 9442	0	5	0
9284	**Adaptor** to fit into Diaphragm No. 9262, to carry the special small lead glass specula listed under Order No. 9520	0	5	0
9290	**Aluminium Filters,** same size and shape as the plain diaphragms and fitting behind either of the plain diaphragms referred to. Used in treatment to allow of rays of varying penetration to be employed for the different cases. (a) 0·5 mm. thick ... **2s. 6d.** (c) 1·5 mm. thick ... **3s. 6d.** (b) 1 „ „ ... **3s. 0d.** (d) 2 „ „ ... **3s 6d.**			

Two or three filters can be used together.

Universal Protective Focus Tube Stand.



This Stand, which has recently been brought right up-to-date, is convenient and efficient for all classes of X-ray work, equally for radiography, examination, treatment and compression.

The movements are extremely gentle, and permit of the tube being adjusted to any position desired. It may be used either above a couch or beneath.

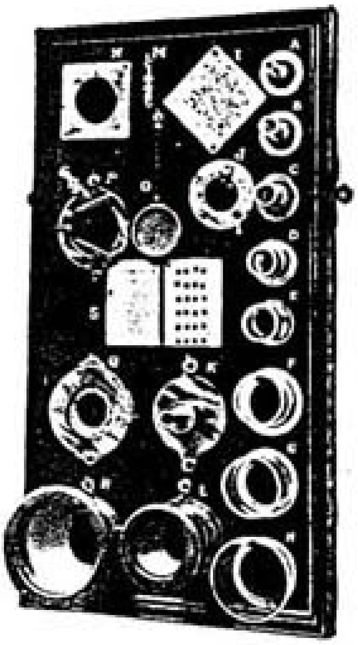
The rise and fall movement is rendered easy by a counterweight. A large clamping screw fixes the cross arm to the vertical column. The transverse movement is effected by a screw mechanism, and the cross arm revolves round the axis of the column. The frame which carries the tube shield is provided with a friction bearing which holds it in any position. Thus any desired position is obtainable with ease and facility.

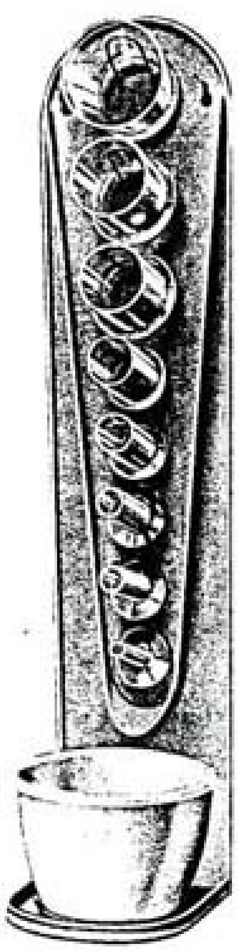
The tube shield is of leaded glass and in every case has an aperture of 10 cm. diameter. For treatment purposes more especially, the shield is best taken of 8 in. diameter, and the slots being deep, enable the small tubes of 130 or 150 mm. to be used in conjunction with the pastilles of Sabouraud. A 180 mm. tube can be used in the shield, but is not usually used in conjunction with Sabouraud pastilles on account of the pastille being too close to the bulb of the tube.

When required more especially for radiographic work a shield of about 9 in. diameter is supplied, permitting the use of the largest focus tubes, 200 mm. diameter. This is not suitable for Sabouraud therapy, but may be used for treatment with Bordier pastilles which are used on the skin.

In either case, of course, the best radiographic and screen work can be carried out with equal facility, and the compression tubes utilised to obviate the movements of respiration when radiographing kidney, &c., and also serving to screen off secondary radiations.

Universal Protective Focus Tube Stand.

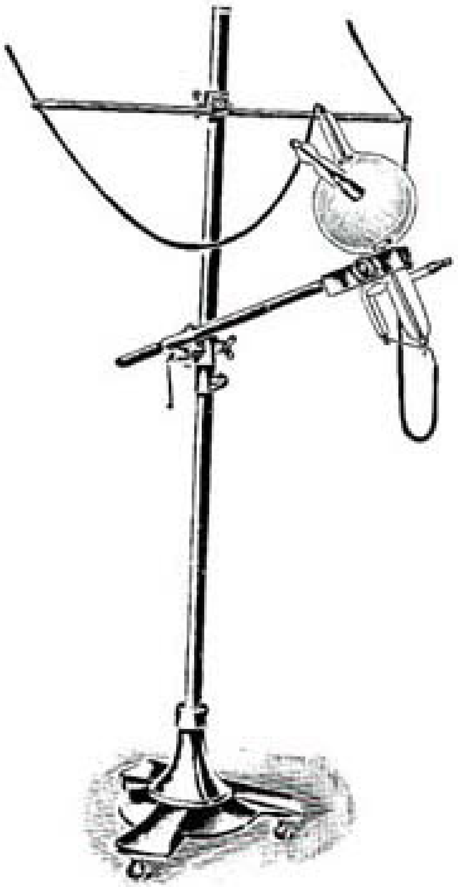




Order No.				
9350	Universal Protective Stand, as described, with Lead glass shield 8 in. diameter	£11	0	0
9352	Set of 8 Lead Glass Specula, Fig. A to H	0	12	3
	A B C D E each **1s. 3d.** F G H each **2s. 0d.**			
9354	Aluminium Filters, 1 to 5 mm. thickness ... ... each	0	2	0
9356	Set of 5 Aluminium Filters, Fig. I	0	7	6
9358	Small Adaptor to take the small Specula. Fig. J	0	5	0
9360	Centring Device, Fig. K	1	0	0
9362	Compressor Tube, Fig L	0	16	6
9364	Pastille Holder. Fig. M	0	3	0
9366	Large Adaptor to take the larger Specula, Fig. N	0	17	6
9368	Centring Device, Fig. O	0	16	0
9370	Kienbock's Adaptor for Tinea, now generally adopted. The attachment holds the Pastille and keeps the Head at the necessary distance, Fig. P...	0	15	6
9372	Iris Diaphragm, Fig. Q	2	0	0
9374	Large Conical Compressor Tube, Fig. R	0	18	0
9376	Sabouraud Pastilles, book of 25 and Standard Tint, Fig. S ...	0	10	0
9380	Specula Rack and Steriliser. The Specula are dipped into a solution of Iodide or other antiseptic, and then placed on the hooks to drain off into the basin. The Rack is white enamelled and designed for fixing to a wall	1	8	0

Focus Tube Stand.

Simple Type.



With heavy finely enamelled iron foot, on castors. With polished wooden upright, polished wooden tube arm with wooden tube clamp. Tube clamp fitted with a spring for holding tube, and also with binding screw. Plated metal universal joint, carrying the tube arm, enabling it to be raised and lowered on the vertical pillar and adjusted to any position desired.

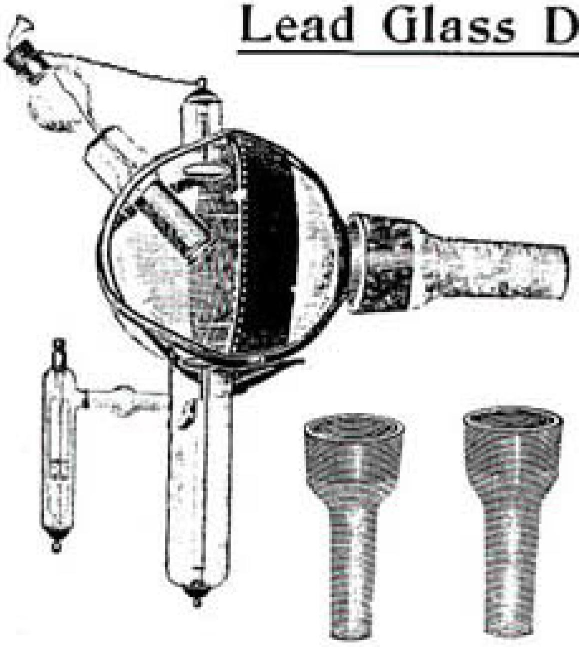
The wooden arm at the top of the stand serves to support the cable connecting from coil to tube, keeping them clear of the tube and one another. This arm can also be adjusted as required.

The metal clamps are nicely plated and the whole of the very best finish. A very efficient and convenient stand for those requiring only a simple type, enabling the tube to be used either under a couch or over.

Order No.	
9400	£2 10 0

For simple Lead Glass Diaphragms for use with this stand, see next page.

Lead Glass Diaphragm.



Lead Glass Diaphragm for therapeutic work, with edge covered with padded leather for the tube to rest against. With leather straps for fastening over the focus tube. **Including** 7 lead glass specula of different sizes below.

Order No.		
9420	... ...	£2 5 0

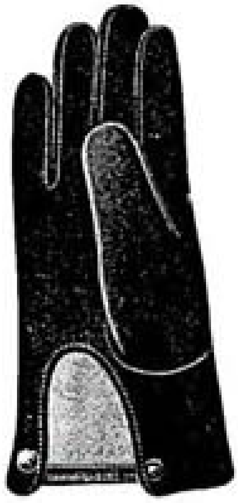
The diaphragm is made for focus tubes of all sizes. Please state diameter of focus tube for which it is required when ordering.

Lead Glass Specula for above—

Order No.	Diameter.		s.	d.
9430	About 12 mm	... ...	3	0
9432	,, 16 ,,	... ...	3	0
9434	,, 20 ,,	... ...	3	0
9436	,, 24 ,,	... ...	3	0
9438	,, 28 ,,	... ...	3	6
9440	,, 35 ,,	... ...	3	6
9442	,, 40 ,,	... ...	3	6

APRONS, GLOVES, &c.

Order No.		
9460	**Protective Apron** of leaded rubber material, reaching from shoulders to knees, with leather straps for fastening over the shoulders and round the waist. These aprons are much lighter and more flexible than the early patterns, and afford excellent protection without hampering the movements. The leaded rubber material is of the highest class	£3 0 0
9470	**Protective Gloves** of leaded rubber material covered outside with kid. The strips of lead rubber are confined to the back of the hand, so that the gloves are very flexible and permit perfect use of the hands, while yet affording excellent protection where necessary ... per pair (State size of ordinary gloves when ordering.)	0 18 0
9480	**Goggles** of leaded glass, best make and finish	0 6 6



PROTECTIVE MATERIALS.

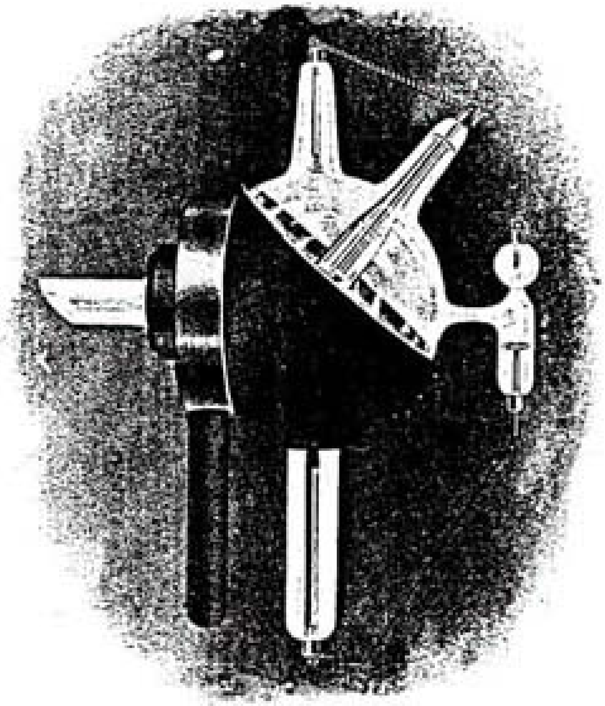
Leaded Rubber Material is supplied in sheets 40 in. by 24 in., and in 1, 1½, 2, 3, 4, 5, and 6 mm. thickness. The average weight of a sheet 1 mm. thick is 7 lbs.

Price per lb. 3s. 6d.

(Subject to great fluctuations. Quotations with pleasure on receipt of requirements.)

Lead Glass Sheets are listed on page 221.

Lead Rubber Diaphragm.



This Diaphragm or Tube Shield is manufactured of a special leaded rubber material, and affords excellent protection to the operator and patient, at the same time permitting of localisation of the action of the rays to the desired area.

It is arranged to carry the various lead glass specula, listed on the next page, which may be introduced into cavities or which may be used merely to limit the area in superficial cases. The specula are supplied in different patterns to meet all requirements and are, of course, interchangeable.

The shield serves for any pattern of focus tube of a certain diameter. It is elastic and non-conductive.

Prices.

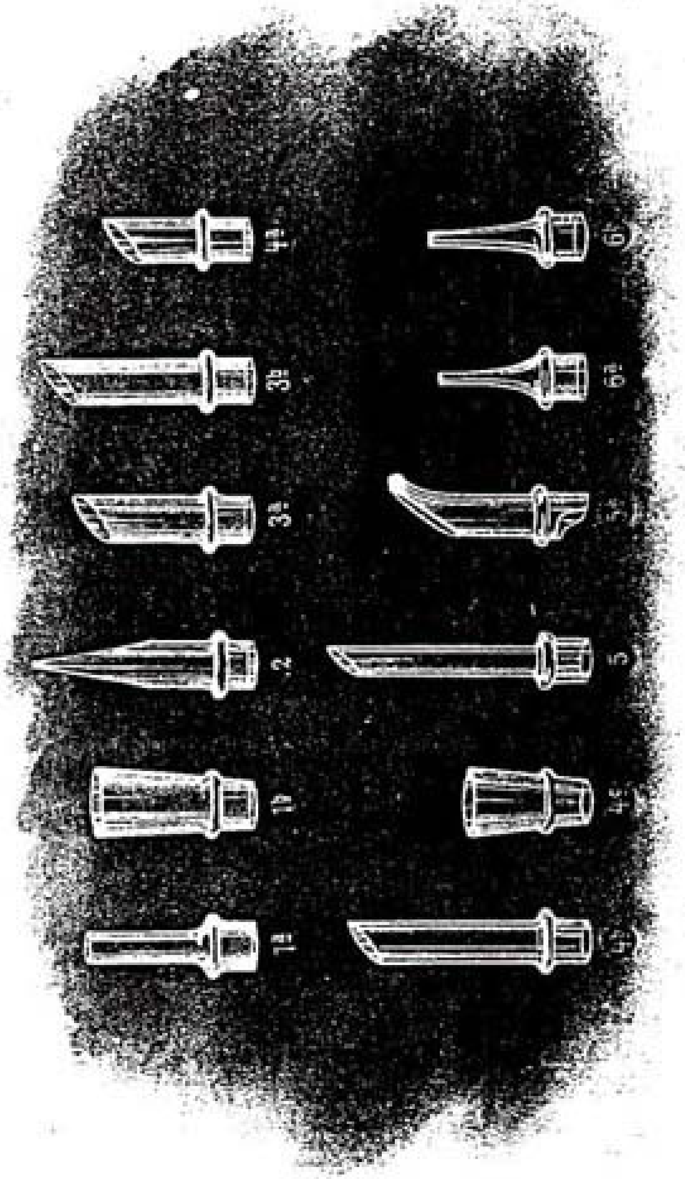
Including Diaphragm Holder and six different Diaphragms.

Order No.				
9500	For tubes of 150 mm. diameter	£1	18	6
9502	,, ,, 160 ,, ,, ...	2	10	6
9504	,, ,, 170 ,, ,, ...	3	4	6
9506	,, ,, 200 ,, ,, ...	4	2	6
9510	Wooden holder for this diaphragm	0	5	0
9515	India rubber for fastening the diaphragm ... per piece	0	5	0

Subject to fluctuations. Specula listed next page.

Lead Glass Specula.

To fit Lead Rubber Diaphragm on previous page.



Best make, with finely rounded and smoothed edges.

Order No. 9520 ... ... 5/- each.

Pattern No.	Use.	Length.	Diameter.	Shape.
1a	Treatment of small external areas,	6 cm.	2 cm.	Straight.
1b	Skin, &c.	6 cm.	4 cm.	Straight.
2	Nose and ear	11 cm.	5 mm.	Straight.
3a	Oral cavity	8 cm.	3 cm.	Oblique.
3b	Jaw	10 cm.	3 cm.	Oblique.
4a	Vagina	6 cm.	3 cm.	Oblique.
4b	Portio Vaginalis Uteri	12 cm.	3 cm.	Oblique.
4c	Introitus Vagina	4 cm.	4 cm.	Straight.
5	Rectum Prostate.	12 cm.	1.8 cm.	Oblique.
5a	&c.	....	....	Oblique.
6a	Intratumoral treatment.	6 cm.	2 mm.	Straight.
6b	Fistula, &c.	6 cm.	4 mm.	Straight.

Tubes can also be made to customers' own designs at the same price. Drawings and measurements are desired in such cases.

X-Ray Couch.

The X-Ray Couch illustrated on following page is the type we have now adopted as our standard. As with most other X-ray appliances, couches have been constructed in numerous patterns, but mostly to fulfil some definite purpose and not for all-round service. As a simple, reliable and efficient couch for general all-round purposes we are satisfied that our model is not surpassed.

The frame is of very solid construction with two strong rails beneath and the whole well polished. The top is of canvas provided with brass eyelets and laced on with rope. The canvas is fitted with turn-over edges that come over the sides of the couch frame, thus making a better fitting and helping to prevent undue sagging in any one part.

Beneath the couch is arranged a protective tube box of large size, capable of carrying the largest tubes in present day use, that is to say 8 in. or more in diameter and still leaving ample clearance to obviate sparking. It is of polished wood with leaded rubber material and leaded glass windows for inspection of the tube while working. Thus efficient protection is afforded.

The box is made to move transversely in a slide, while box and base travel together laterally along the two rails on rollers, so that the box can be moved to any position desired. Two terminals are fitted to the couch for connecting the cables from the coil, and the current is then led to the box by means of two spring metal tapes which wind and unwind, so that there is never any slack wire to cause sparking or to get in the way.

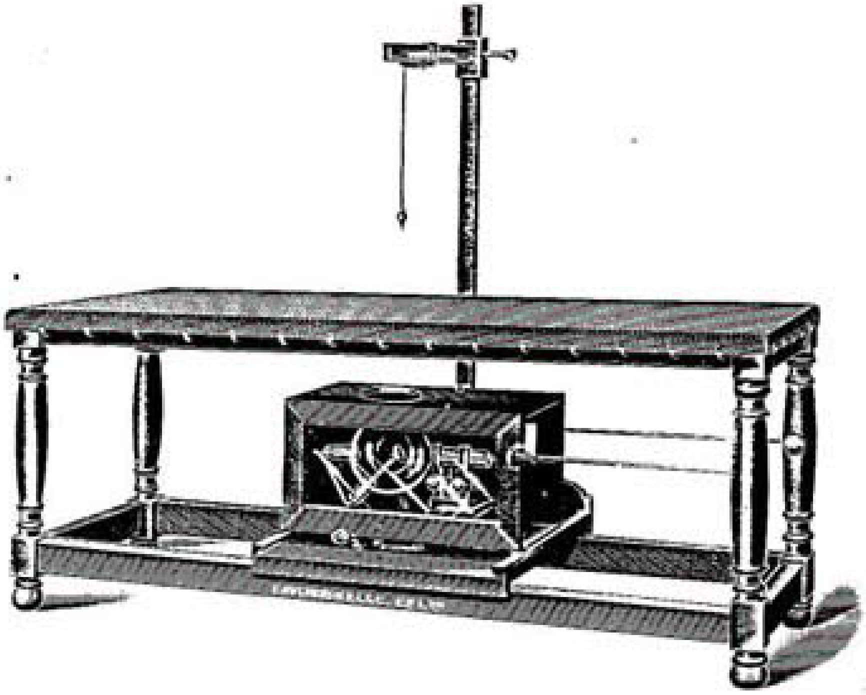
The opening in the top of the box is circular. A slide is provided so that different diaphragms can be inserted as required, these having apertures of various sizes and either round, square or oblong. It is now fully recognised that it is very important to use a diaphragm with a small aperture just sufficiently large to illuminate the actual part it is desired to examine with the screen, shutting off all other light. It is quite easy to observe for instance a stone in the kidney under these conditions, whereas with a large area illuminated by the rays it would be impossible. The other essential condition is that the operator should have been in the completely darkened room for some minutes that his eyes shall have become accustomed, as we have mentioned in the reading matter on earlier pages.

An iris diaphragm can be fitted to the box if desired, mounted on a wooden board and interchangeable with the simple diaphragms.

A wooden tube clamp is fitted inside the tube box allowing adjustment of the focus tube to the position desired, so that the anti-cathode can be arranged immediately beneath the centre of the aperture.

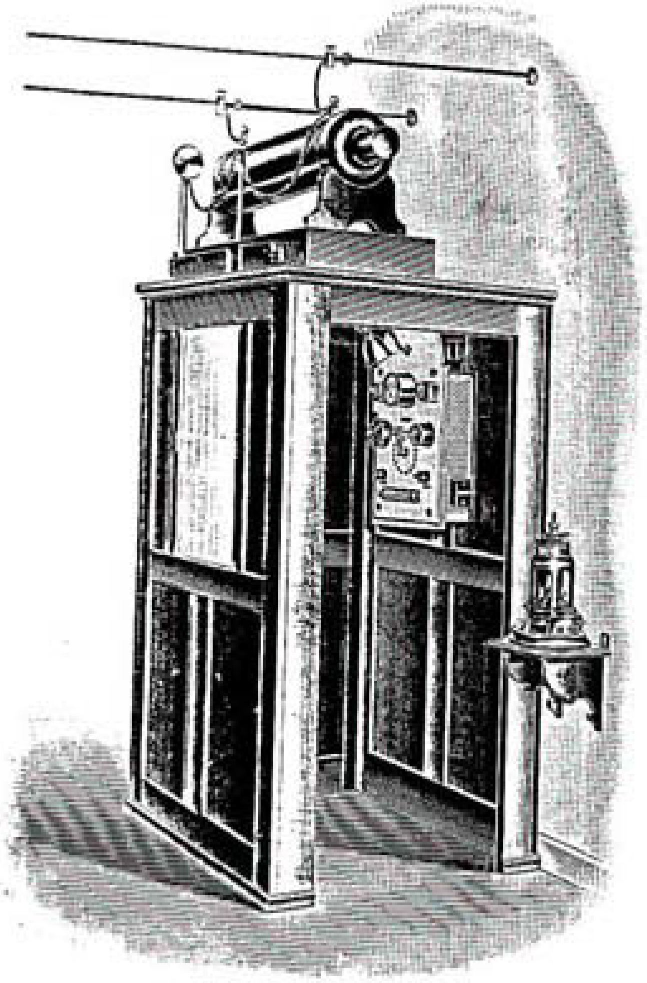
Localising Device.—Permanently attached to the tube box is a vertical wooden pillar carrying a horizontal arm above the patient. Along this arm slides a little wooden fitting with a plumb weight, the fitting having a pointer and moving over an engraved scale.

A corresponding scale is fitted to the base on which rests the tube box, with a little pointer on the box itself. The box may thus be moved to any position, and a glance at its scale will indicate a certain number. Move the fitting with plumb weight along the horizontal arm over the patient to a corresponding number, when the plumb weight will rest immediately over the centre of the tube box aperture. This is a very simple and convenient arrangement, which will be found of great service in actual work. Unless one works with the straight rays there is bound to be considerable distortion.



Order No.				
9550	X-Ray Couch, as described, without the localising attachment, but including 2 round and 2 square plain metal diaphragms. The diaphragms can be placed into the slide made for them one over the other, to save having to withdraw each when wishing to replace it by a smaller one	£15	0	0
9551	Same exactly, but fitted with localising attachment as described and as illustrated	17	10	0
9558	Iris Diaphragm of the highest class, finely plated. Very smooth working. Mounted on polished wood board and made to slide over box aperture, being interchangeable with the simple diaphragms	1	15	0
9562	Simple metal diaphragms, with either round, square or oblong apertures to dimensions required ... ... each	0	3	0

Protecting Houses, &c.



X-Ray Protecting House lined inside with lead and fitted with large lead glass window. The glass is very opaque to the rays yet clear so as to permit perfect observation of the focus tube working outside. The controlling switchboard is installed inside the house, so that all necessary regulations can be effected with the operator thoroughly protected from the rays. The coil can be conveniently mounted on the top of the house, and the tube stand would be placed just in front of the window.

These protective houses, walls and cubicles can be built to any dimensions and in any pattern to suit the room in which they are to be used. The house illustrated is of highly polished oakwood, 80 inches in height, 50 inches wide and 42 inches deep. Window 34 inches by 20. Lined with lead and with lead glass window as already mentioned.

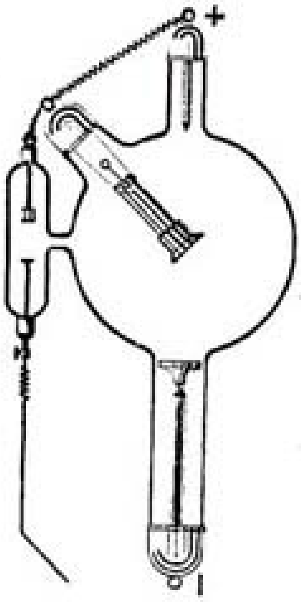
Order No.	
9580	£15 0 0

Estimates for any description of house, wall or cubicle furnished with pleasure on receipt of requirements.

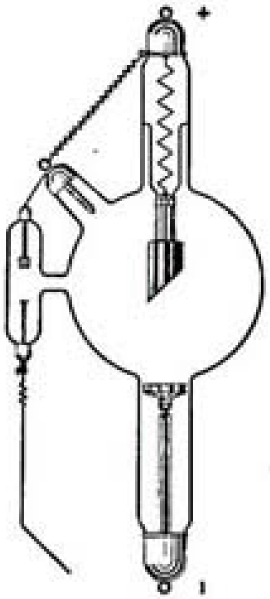
Radiologie Focus Tubes.

Latest Patterns.

These Tubes are of the very highest class. They are strongly constructed in every detail, with massive metal caps over the different stems, and in every way are of perfect manufacture and finish. They are fitted with the intense regenerator by Dr. Furstenau, which is practically inexhaustible inasmuch as the device can be used many thousands of times. It can be operated without switching off the current or changing any connecting wires, the device being set in action by merely approaching the springy wire towards the bottom of the cathode stem, using a rod of glass, ebonite or other insulating medium.



No. 9600.



No. 9620.

Order No.		
9600	Diameter 6 in.	£3 5 0
9604	,, 7 ,, ...	3 15 0
9608	,, 8 ,, ...	4 5 0

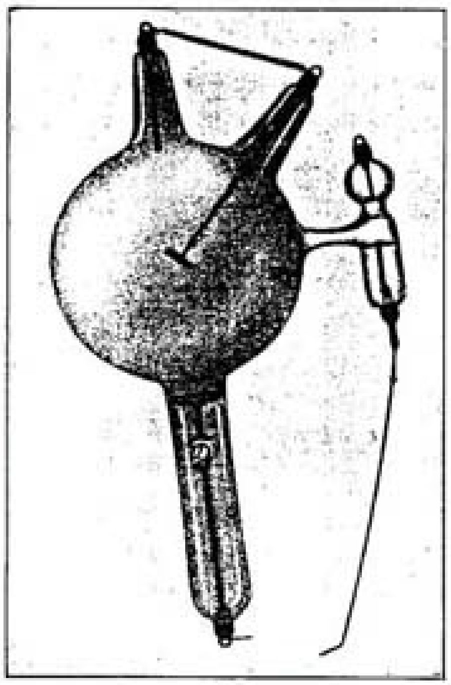
These tubes have a very strong anti-cathode, backed by massive copper. They are suitable for the best radiographic and screen work, being capable of withstanding heavy currents. They maintain as steady a vacuum as any tube, and give excellent definition and contrast.

Order No.		
9620	Diameter 8 in.	£5 5 0

This tube is provided with a cooling chamber inside the anti-cathode, which receives the heat that is generated and brings about its dissipation. It can be run for comparatively long periods without becoming injuriously heated. It is capable of withstanding the most intense discharges for rapid radiography or as required when screening deep parts.

Light Anode Tubes.

These tubes with only a light anti-cathode are only suitable for ordinary work, and cannot be expected to withstand the intense discharges as given by a modern intensified spark coil. For older coils and for light radiographic and therapeutic work they give excellent results.



With device for regeneration of vacuum.

Order No.		Diameter.			
9640	$5\frac{1}{2}$ inches	140 mm.	£1	5	6
9642	$5\frac{7}{8}$,,	150 ,,	1	11	6
9644	$6\frac{1}{4}$,,	160 ,,	1	18	6
9646	$6\frac{11}{16}$,,	170 ,,	2	2	6
9650	$4\frac{1}{4}$,,	110 ,,	1	5	6

Order No. 9650 is specially made of small diameter and is therefore suitable for therapeutic work, Sabouraud treatment, &c. It is of specially thin glass and thus offers very little resistance to the active rays.

Same tubes but without regeneration device.

Order No.		Diameter.			
9660	5 inches	125 mm.	£0	15	6
9662	$5\frac{1}{2}$,,	140 ,,	1	2	6
9664	$5\frac{7}{8}$,,	150 ,,	1	6	6
9666	$6\frac{5}{16}$,,	160 ,,	1	12	6

Heavy Anode Tubes.

This type is the best all-round tube at a moderate price. It is fitted with a very strong and heavy anti-cathode to withstand powerful currents and to dissipate the heat. It is also provided with a glass mantle round the anti-cathode which minimises the effect of the secondary rays which occur on the "making" of the current.

IN consequence of the heavy advance in the costs of all materials, etc., we have been advised by the makers that they, in common with others, have been compelled to increase the prices of their Focus Tubes as listed on Pages 210-213 of our Catalogue.

The matter has been under consideration for some time past, and in each instance the advance has been carefully calculated according to the Tube, no increase being more than is absolutely demanded by the extra cost of manufacture.

The prices now in force are as follows :—

Order No.					Order No.					
9640	... ...	£1	7	6	9680	... ...	£2	12	6	
9642	... ...	1	15	0	9682	... ...	2	17	6	
9644	... ...	2	2	0	9684	... ...	3	7	6	
9646	... ...	2	7	6	9700	... ...	4	5	0	Reduced
9650	... ...	1	10	6	9704	... ...	4	5	0	
9660	... ...	0	17	6	9720	... ...	4	15	0	+ 10/-
9662	... ...	1	5	0	9722	... ...	5	10	0	+ 10/-
9664	... ...	1	10	6	9724	... ...	7	10	6	+ 10/-
9665	... ...	1	15	6	9742	... ...	5	15	0	+ 10/-
					9744	... ...	6	7	6	+ 10/-

Valve Tubes. Page 219.

9780	... ...	1	7	6	9783	... ...	1	17	6
9781	... ...	2	12	6	9784	... ...	3	5	6
9782	... ...	3	7	6	9785	... ...	4	4	0

With Regulator or Regeneration Device.

Order No.			Diameter.				
9680	5⅞ inches	... ...	150 mm.	... ...	£2	7	6
9682	6$\frac{11}{16}$,,	... ...	170 mm.	... ...	2	12	6
9684	7⅞ ,,	... ...	200 mm.	... ...	3	2	6

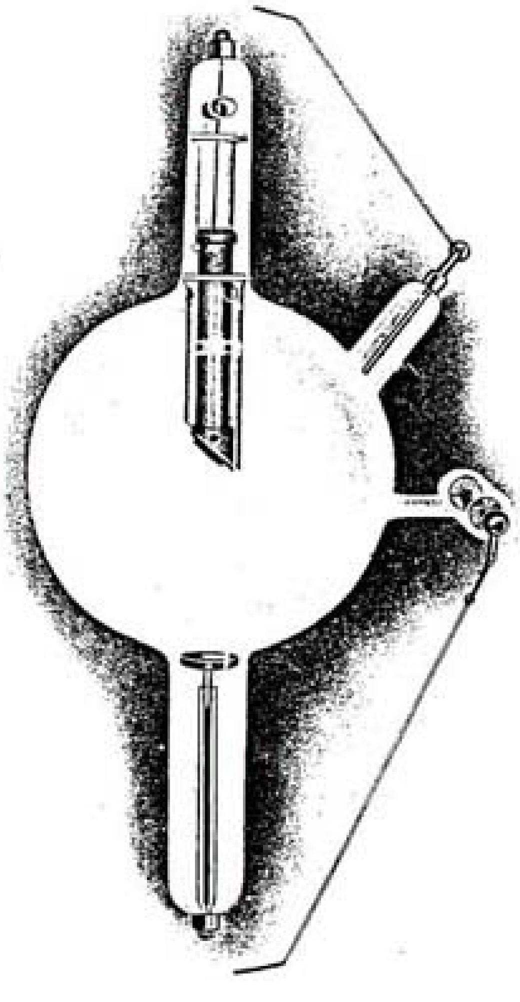
The same tube is also supplied without the glass mantle if so ordered.

The Mammoth

Heavy Anode Focus Tube.

This tube is designed for instantaneous radiography, screen work, &c., work necessitating the passage of very heavy currents. An essential feature of the tube is the use of a special alloy in the construction of the anti-cathode, whereby the disintegration of the surface is reduced to a minimum, and the tube enabled to maintain a very steady vacuum, the increase of hardness being correspondingly slow.

Although primarily intended for instantaneous work as mentioned above, a modified mammoth tube is supplied suitable for therapeutic work. In this latter the focus, instead of being sharp, is diffuse. To distinguish the two tubes readily, the radiographic tube has a **red** anode tube and the therapeutic a **blue** anode tube. Both made in one size only, viz., 8 in. diameter.

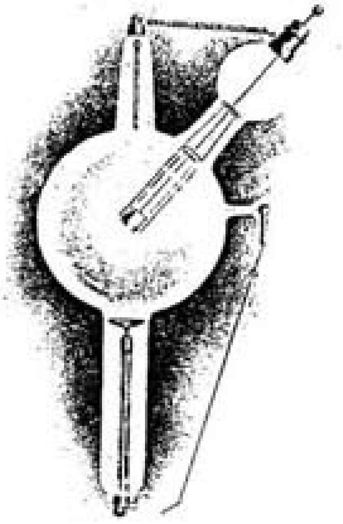


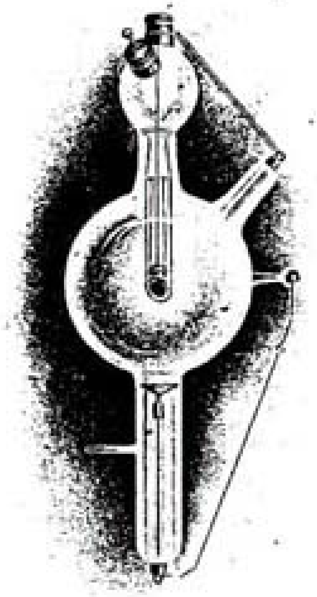
With Regulator or Regeneration Device

Order No.				
9700	For Radiography, 200 mm. (8 in. diam.)	£4	12	6
9704	For Therapy, 200 mm. (8 in. diam.)	4	2	6

Water-cooled Focus Tubes.

These tubes differ in construction to the usual, inasmuch as they are not provided with a heavy mass of metal at the anti-cathode in order to dissipate the heat, but instead they are fitted with a receptacle for water and so arranged as to bring the water into **direct contact** with the back of the target. A comparatively heavy current may be passed through these tubes for a much longer period than would otherwise be possible, as the temperature of the anti-cathode cannot rise above the boiling point of the cooling medium. This avoidance of overheating enables the vacuum to remain much more constant and the life of the tube thereby lengthened. These tubes are therefore especially suitable for prolonged running.





Vertical type, fitted with Regeneration Device.

Order No.			Diameter.		
9720	$6\frac{11}{16}$ in.	...	170 mm.	... ...	£4 7 6 + 10s.
9722	$7\frac{7}{8}$,,	...	200 ,,	... ...	5 2 6 + 10s.
9724	$9\frac{7}{8}$,,	...	250 ,,	... ...	7 10 6 + 10s.

An allowance of 12s. 6d. will be made for the anode of a worn out tube.

Universal type, fitted with Regeneration Device.

Order No.			Diameter.		
9740	$6\frac{11}{16}$ in.	...	170 mm.	... ...	£5 7 6 + 10s.
9744	$7\frac{7}{8}$,,	...	200 ,,	... ...	6 7 6 + 10s.

If fitted with an iridium anode, the extra cost is £1 7s.

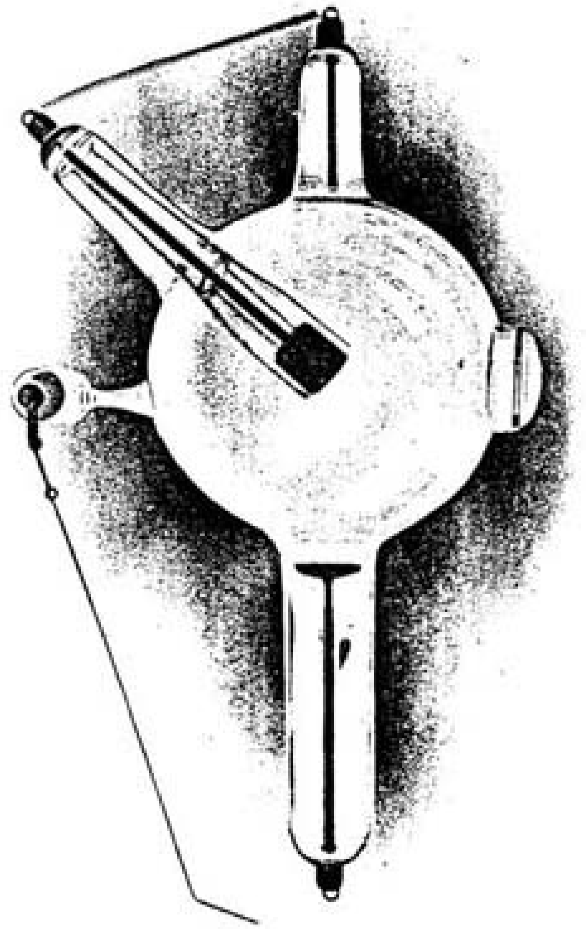
An allowance of 15s. will be made for the platinum anode of a worn out tube.

The Universal type may be used in practically any position. It is only necessary to see that the cap on the water bulb which is without a perforation is screwed on to that aperture which happens to be the lower. The second cap, with a perforation, thus becomes uppermost and allows steam to escape but not the water.

The Lindemann Focus Tube.

Focus Tubes with Lithium Glass Windows.

Just at the time of going to press a new patent glass has been introduced for focus tubes. In this glass lithium is utilised instead of the usual sodium. The new glass is almost completely transparent to the softest of the Röntgen rays, and the invention is therefore of the greatest importance. Experiment has shown that pastilles were changed by the rays through the lithium glass before any appreciable alteration had taken place in pastilles exposed to the ordinary rays. Whilst in regard to radiography the richness of detail obtained in radiographs of various parts, and the reduction in the time of exposure, leave no doubt as to the efficiency of the new glass.



It is stated that only 10 per cent. or 15 per cent. of the rays are absorbed by the lithium glass as against some 60 per cent. absorbed by an ordinary tube. The new glass allows the passage of rays so soft as to be quite unable to penetrate ordinary glass, yet these soft rays are of great importance and exercise a very marked effect on a photographic plate.

Much more will no doubt be heard respecting this invention in the near future. For the moment we would refer those interested to an article in the "Archives of the Röntgen Ray" for November, 1911, which will be found extremely interesting and instructive.

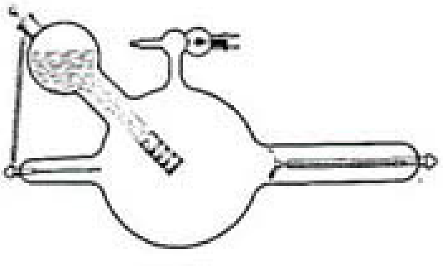
We shall be happy to send a reprint of this article on request so long as the present supply lasts.

The illustration shows one of our Tubes, No. 9680, fitted with a window of lithium glass. Any of the tubes listed on pages 210 to 213 can now be supplied with a window of the new glass, the extra cost being—

For tubes of less than 170 mm. diameter	5 0
For tubes of 170 mm. diameter or over	[illegible] 5 0

Focus Tubes.

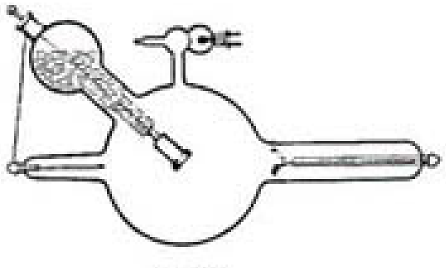
With new pattern regenerating device, which is operated by holding against the two contact pegs of the little branch tube an ordinary dry cell giving about 3-4 volts. The action is very slow, so that there is no liability of over-softening as with those devices operated by the spark coil itself. If desired two wires can be connected from the device to a little bell push placed outside the protective tube box, or at any little distance, with two or three dry or wet cells in circuit, or with one of the ordinary 3 or 4 volt dry batteries as used with pocket lamps and torches.



No. 9750.

Focus tube with water-cooled anti-cathode, for all-round work, with new type regeneration device which is practically inexhaustible.

Order No.			
9750	Diameter 150 mm., about 6 in.	... ...	£2 10 0
9751	,, 170 ,, ,, 6¾ ,,	... ...	2 15 0
9752	,, 200 ,, ,, 8 ,,	... ...	3 0 0



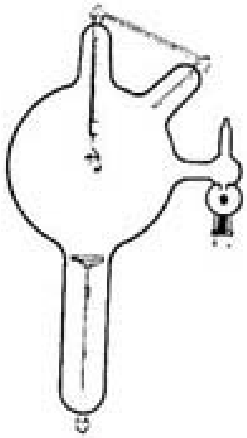
No. 9754.

Focus tube with heavy anti-cathode, water-cooled. Capable of withstanding heavy discharges for rapid radiography, or for time exposures or lengthy screen work. It can be used without water for short exposures. Fitted with new regenerating device.

Order No.			
9754	Diameter 150 mm., about 6 in.	.. ..	£4 15 0
9755	,, 170 ,, ,, 6¾ ,,	... ...	5 0 0
9756	,, 200 ,, ,, 8 ,,	... ...	5 10 0

Focus Tubes.

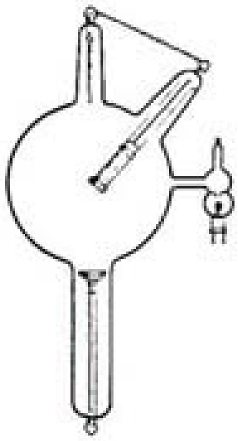
With new pattern Regenerating Device as described on previous page.



No. 9760.

Focus tube with medium heavy anti-cathode for general work.

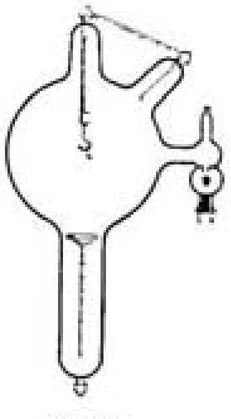
Order No.								
9760	Diameter	150	mm.,	about	6 in.	£2	15	0
9761	,,	170	,,	,,	6¾ in.	3	0	0
9762	,,	200	,,	,,	8 in.	3	5	0



No. 9764.

Focus tube with heavy anti-cathode, capable of withstanding heavy discharges for rapid radiography, as also for time exposures or lengthy screen work.

Order No.								
9764	Diameter	150	mm.,	about	6 in.	£3	15	0
9765	,,	170	,,	,,	6¾ in.	4	0	0
9766	,,	200	,,	,,	8 in.	4	10	0



No. 9768.

Focus tube in smaller sizes, specially for therapeutic work.

Order No.								
9768	Diameter	135	mm.,	about	5¼ in.	£1	15	0
9769	,,	150	,,	,,	6 in.	2	5	0
9770	,,	170	,,	,,	6¾ in.	2	5	0

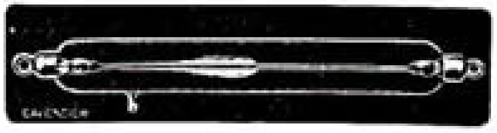
Dry cell battery for operating the regenerating device of the tubes above, and on previous page.

9774	... ...	0	3	0

Oscilloscope Tube.

An Oscilloscope Tube is a very simple little instrument, but is of great utility. Its purpose is to detect the presence of reverse current through the focus tube. When reverse current is very heavy as in certain cases it can be easily seen by the eye, but in other cases its presence is not easy to tell, and yet it may quite possibly be the sole cause of indistinct outline in the radiographs or may explain the presence of certain delusive shadows. The objections or drawbacks consequent upon reverse current have been fully dealt with in the reading matter at the commencement of this section of the catalogue.

The oscilloscope tube is merely placed in circuit with the focus tube, the simplest method being to attach it by an inch or two of wire to the cathode end of the focus tube, the cable from the coil then connecting to the lower end of the oscilloscope tube in place of going to the cathode direct. The tube is about 8 in. long by 1 in. diameter, and is fitted inside with two thin metal stems which all but meet in the centre. The current in jumping across this little gap creates a fluorescence which appears to be blown along one stem by the passing current. If reverse current is flowing the fluorescence appears on both of the little stems in opposite directions away from the centre, and with the proper fluorescence much stronger than the fluorescence caused by the weaker reverse current. The tube thus detects instantly the presence of reverse current and enables it to be suppressed by means of a simple series spark gap or valve tube, &c.



OSCILLOSCOPE TUBE

for detecting Reverse Current.

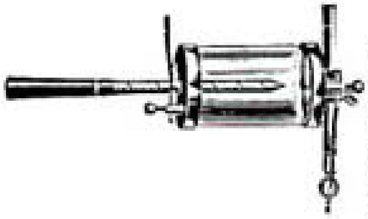
Order No.
9778 ... ... **£0 15 0**

The illustration shows the fluorescence in one direction only, that is to say without reverse current. As we have stated under the chapters on Coils and Interrupter, our outfits are free from reverse current with any air gap exceeding about 1 in., so that although theoretically and actually some reverse current does exist, it is so little as to be absolutely negligible in practice. See pages 180 and 181.

Series Spark Gap.

For Suppressing Reverse Current.

(See reproductions of photographs, pages 180 to 181)



A spark gap in **series** with the focus tube is a simple and convenient means of suppressing reverse current when not of undue proportions. Certain focus tubes have an inherent tendency to pass reverse current owing to peculiarities in their construction, whereas other tubes working under identical conditions are entirely free.

In such cases a series spark gap is all that is necessary to give the focus tube a sharp division, with perfect definition, rendering the tube more efficient and prolonging its lifetime.

Reverse current only occurs with our coils and centrifugal motor mercury interrupter under such conditions as we have just referred to, for reasons explained fully in reading matter at commencement of this section of our catalogue. We therefore fit a series spark gap as well as the usual parallel spark gap, as per illustration and listing on page 190, when desired.

In order to eliminate heavy reverse current as occurs with some makes of coil and interrupter, or such as is unavoidable with electrolytic interrupters, the valve tubes are more effective than a series spark gap. Otherwise, the spark gap has the advantages of being much cheaper and of unlimited lifetime. The gap does not require any attention as do the vacuum valve tubes, which tubes, of course, become used up in course of time, and moreover it does not generate X-rays.

The spark gap can be arranged to fit direct to the terminal of the spark coil, or it can be arranged with a simple clamp to fit on to a tube stand; it can be mounted on a little wooden base or in any other manner to suit any particular outfit. Some of these modifications entail slight extra cost, and unless otherwise ordered they are supplied with a little stem to fit into the terminal of coil, which is the method usually adopted.

Order No.		
9779	**Series Spark Gap,** with adjustable rod and with plate, strong glass cylinder. With stem to fit into terminal of spark coil (unless otherwise ordered)	£0 16 6

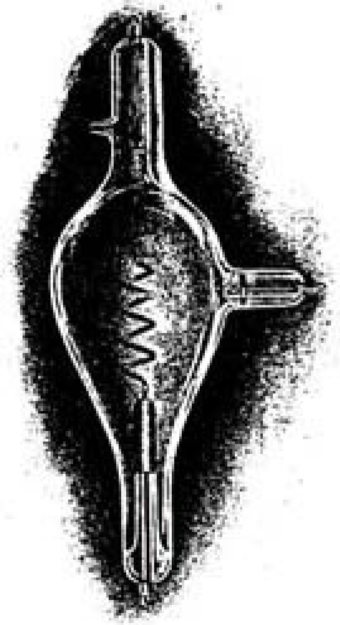
New soft tubes with their very low resistance are often all the better for being used with a series spark gap, as it is very important to suppress reverse current when training up new tubes, otherwise a stable vacuum in later life is impossible. When the tubes become harder, the greatly increased resistance effectively cuts out all reverse. When desired the point of the spark gap can be screwed right home against the plate, thus putting the gap quite out of action. If reverse current is passing through a tube, the rod is merely screwed back from the plate a little distance until the reverse current is eliminated and the tube burning with a sharp division.

This simple arrangement will often make an otherwise bad tube work perfectly.

Valve Tubes.

For Eliminating Reverse Current.

(See reproductions of photographs, pages 180 *and* 181.)



Certain focus tubes have an inherent tendency to pass reverse current, owing to peculiarities in their construction, whereas other tubes working under identical conditions are entirely free.

In such cases a valve tube is introduced into the circuit with the focus tube with excellent results. The division across the focus tube becomes sharp and the definition greatly improved, rendering the tube more efficient and prolonging its lifetime.

In ordinary work a single valve tube is all that is necessary, but when working with very heavy currents, especially with an electrolytic interrupter, then a triple valve is required.

The triple valve consists of three of the single tubes joined together side by side, that is to say, working in parallel. A great advantage of this arrangement is that there is only one vacuum to control, whereas with three separate valve tubes one experiences difficulty in keeping them working with similar degrees of vacuum. Thus, with the triple type all three valves work uniformly.

Some workers make use of two single valve tubes, but they are arranged in series, one on each pole of the coil, so that the idea is not to obtain passage for heavier currents, but to have double the amount of resistance offered to the reverse current.

Connection. If the valve tube is connected to the positive pole of the spark coil, the connecting cable from the coil must be taken to the plain concave electrode of the valve tube, a connecting wire afterwards being taken from the spiral electrode of the valve to the anode of the focus tube.

If connected to the negative pole of the coil, the connecting cable from the coil will go to the spiral, and a wire from the plain concave electrode to the cathode of the focus tube.

Prices.

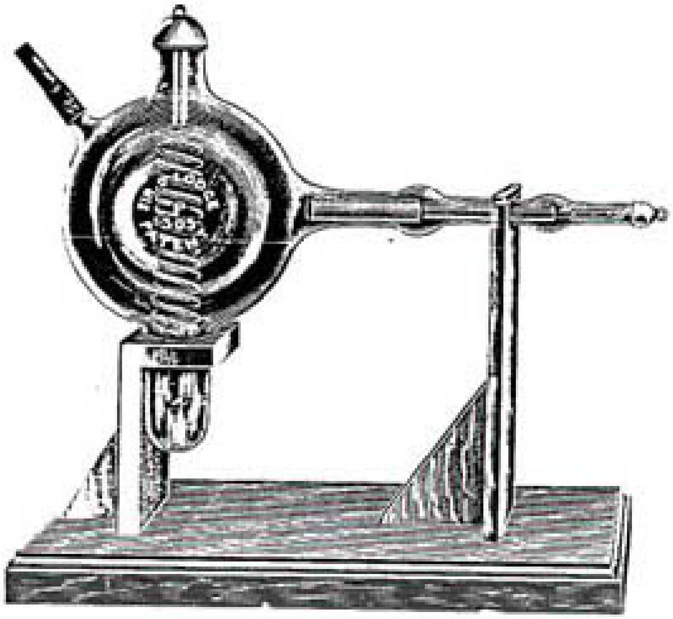
Order No.	Clear Glass.		Order No.	Coloured Glass.	
9780	Single	£1 5 6	9783	Single	£1 13 6
9781	Double	2 7 6	9784	Double	3 0 6
9782	Triple	3 2 6	9785	Triple	3 18 6

The coloured glass tubes are preferred by many, as, being of a dark orange tint, they disguise the fluorescence and thus permit of better judgment of the condition and working of the focus tube.

Valve Tubes.

Sir Oliver Lodge's High Tension Valve.

(See reproductions of photographs, pages 180 *and* 181.)



This valve consists of a vacuum tube with a spiral aluminium cathode and an anode in the form of an iron wire enclosed within two sheaths of copper. These sheaths, whilst assisting the action of the tube, protect the glass from continual bombardment, and thus eliminate the possibility of the glass fracturing when using excessively heavy discharges.

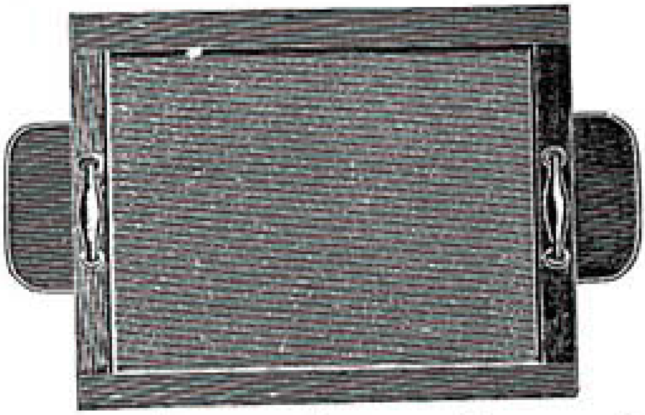
The special method of exhaustion results in the valve tubes having a distinctive and peculiar red colour. and produces tubes in which the vacuum remains constant under all conditions.

The tubes are notable for their long life, some having been in use for more than two years without any apparent alteration. They will easily carry the heaviest currents: they have a very low resistance indeed the right way: they require no attention and practically no regulation.

Order No.		
9786	Complete on wooden stand	£2 0 0

Fluorescent Screens.

These screens are of the very highest class. They are very evenly coated with barium platino-cyanide, are extremely brilliant and give most excellent definition and contrast. They give a much better picture in every respect than the cheaper and inferior screens which are very indifferently coated. Mounted in strong wood frame.



Order No. 9788.	A.	B.	C.	D.	E.
Size in cm.	18 × 13	24 × 18	30 × 24	40 × 30	50 × 40
" inches	7 × 5	9½ × 7	12 × 9½	16 × 12	20 × 16
Price	**£1 14 0**	**£2 16 0**	**£4 12 0**	**£7 10 0**	**£12 0 0**

Subject to fluctuations of the Platinum market. Current prices on request.

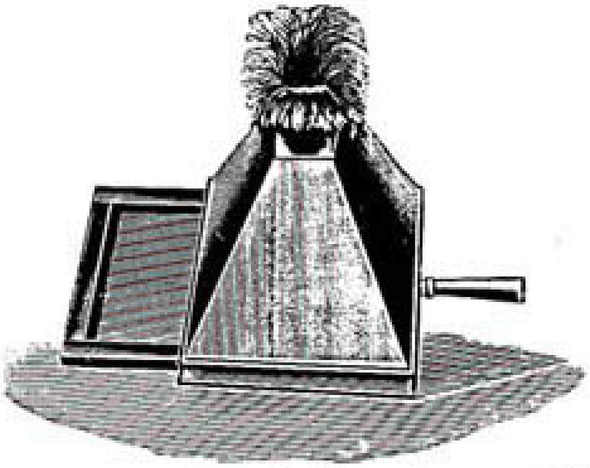
Lead Glass Plates to fit the above screens. These plates afford protection to the face of the operator, while also guarding the screen itself from dust and damage. They are strongly recommended and very rarely is a screen purchased without one. The plates we supply are of glass that is particularly clear and more free from flaws than the usual.

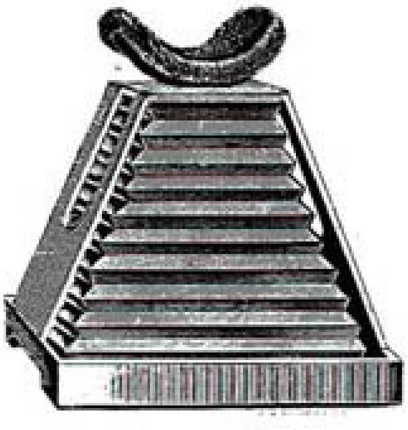
Order No. 9789.	A.	B.	C.	D.	E.
Size in cm.	18 × 13	24 × 18	30 × 24	40 × 30	50 × 40
Price	**2s. 6d.**	**4s. 0d.**	**6s. 6d.**	**10s. 6d.**	**15s. 0d.**

Lead glass plates can be supplied to any dimensions required, for windows of protecting houses, &c. Prices quoted on request.

Protecting Handles. Fluorescent screens are often fitted with two metal handles, which are screwed to the wooden frame. Two lead plates are also fitted so as to protect the hands of the operator. See illustration above.

Order No.		
9790.	Per pair	£0 7 0





Cryptoscope to receive fluorescent screen, enabling examinations to be carried out in daylight.

Order No.		
9791.	Rigid type for screen 24 × 18 cm.	£1 10 0
9792.	" " 30 × 24 cm.	1 15 0
9793.	Collapsible type for screen 24 × 18 cm....	1 15 0
9794.	" " " 30 × 24 cm.	2 0 0

The "Cavendish" Accelerating Screens.

By DR. EPPENS.

Accelerating or intensifying screens have been on the market for many years past, but the new type which has been brought out during the last few months has little in common with the earlier ones. The old screens reduced the exposures but very little, and then only at the cost of very considerable grain marking on the negative. For this reason they never came into anything approaching general use.

The new type of Accelerating Screen marks a distinct step forward in X-rays, and coming just at the time when very rapid exposures are the great aim of the radiographer they are particularly acceptable. As proof of their practical utility it need only be mentioned that they are now universally adopted by all the leading workers.

For really instantaneous radiography they are essential as also for all very rapid exposures. They reduce the time of exposure to about one-twelfth of normal, and our own line of these screens provide a negative free from "grain," a remark which does not apply truly to others of the new types. Several patterns were placed on the market in rapid succession, and having carefully tested four well-known makes side by side, and having had the opinion of three or four of our best known X-ray workers, we are satisfied that the screen we have adopted is the best. We have no special interest in selling one make any more than another except that we wish to sell the best, and on this point we are quite satisfied with what our most careful comparative tests have taught us.

Our screens are just a little more rapid than others and are free from grain. They lose their phosphorescence very quickly, so that the same screen can be used for a series of exposures right off, whereas with other types a very considerable interval of time must be allowed to elapse between each use in order to allow of this. All that is necessary is the few minutes' interval which always occurs during the arranging of the next patient. Another advantage of our screen is that it is not at all opaque to the rays, so that it can be used above a plate or beneath : that is to say, the radiograph may be taken through the thickness of the plate or through the thickness of the screen. The advantage of taking the radiograph through the screen is that it is thinner than the glass, so there does not occur the same extent of diffusion or distortion of outline as otherwise is inevitable to some degree.

An objection to some makes of Accelerating Screen consists in the fact that certain markings and irregularities occur in the coated surface of the screen : but this does not apply to our screen, the surface of which is beautifully smoothed and even. As already remarked our screen is in use by many of the best known X-ray workers of the country, and they testify that some of the finest and most rapid radiographs they have ever secured have been taken with this screen. Their independent opinion can always be had for the asking.

Notwithstanding the advantages of our screen it is nevertheless being sold at a price no higher than the other makes and in certain cases even cheaper. Like most new inventions the first patterns were placed on the market at very high prices.

These screens are now universally in use and are favourably regarded on all sides. Apart from their other advantages is the fact that there results a great saving of the focus tube especially in view of the very heavy currents given by the modern intensified coil in rapid work.

Prices.

THE CAVENDISH ACCELERATING SCREEN.

By DR. EPPENS.

Greatest Rapidity. Freedom from Grain. Perfect Definition and Detail.

English Sizes.			Centimeter Sizes.		
Order No.			Order No.		
9800	6½ × 4¾ in. ...	£0 16 0	9820	18 × 13 cm. ...	£0 18 0
9802	8½ × 6½ ,, ...	1 7 0	9822	24 × 18 ,, ...	1 10 0
9804	10 × 8 ,, ...	1 15 0	9824	30 × 24 ,, ...	2 5 0
9806	12 × 10 ,, ...	2 10 0	9826	40 × 30 ,, ...	3 12 0
9808	15 × 12 ,,....	3 5 0	9828	50 × 40 ,, ...	5 8 0

Care must always be taken to guard the fine surface of the screen from dust and damage, such as scratches, creases, &c. If, however, the surface becomes soiled and dusty after some use it may be **washed,** a further important advantage of our screen. Take some clean cotton wool or a soft sponge, moisten same and use a little soap, afterwards wiping the surface carefully without soap.

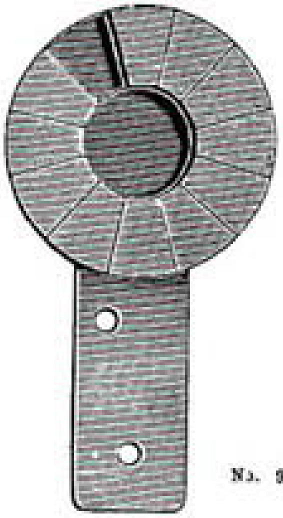
SPECIAL CASSETTES OR EXPOSURE CASES.

The one essential condition in the successful use of the Accelerating Screen is that the coated surface of screen must be firmly and evenly pressed against the coated surface of the X-ray plate. Where not in close contact it fails to act, with the result that the negative shows specks and under-exposed patches, &c. For the same reason the surfaces must be freed from all dust particles, preferably by wiping with a fine camel hair brush.

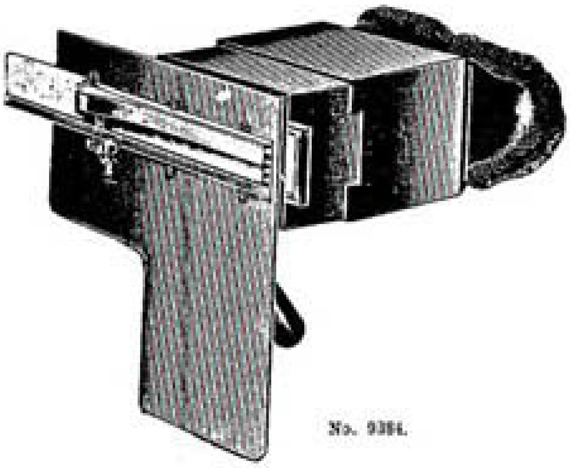
In order to secure the necessary close contact, and thereby the best results, the special Cassettes should be employed. They ensure close contact between the coated surfaces by spring pressure. Of best design and finish.

English Sizes.			Centimeter Sizes.		
Order No.			Order No.		
9840	6½ × 4¾ in. ...	£0 15 0	9860	18 × 13 cm. ...	£0 15 0
9842	8½ × 6½ ,, ...	0 16 6	9862	24 × 18 ,, ...	0 17 6
9844	10 × 8 ,, ...	0 18 6	9864	30 × 24 ,, ...	1 6 0
9846	12 × 10 ,, ...	1 7 0	9866	40 × 30 ,, ...	1 12 6
9848	15 × 12 ,, ...	1 15 0	9868	50 × 40 ,, ...	1 18 0

Radiometers.

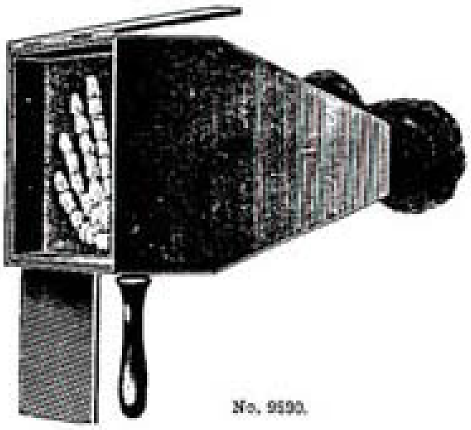


No. 9880.



No. 9884.

Order No.		
9880	**Radiometer by Benoist,** with 12 aluminium segments of progressive thickness, mounted in circular form on a silver plate. For measuring the penetration of the rays, using a fluorescent screen	£1 15 0
9882	**Radiometer by Benoist,** with 8 aluminium segments of progressive thickness, mounted on a straight oblong silver plate. For measuring the penetration of the rays in conjunction with a fluorescent screen...	0 17 0
9884	**Crypto-radiometer by Prof. Wehnelt,** for directly reading the hardness of a focus tube. Fitted with a silver plate and an aluminium strip of gradually increasing thickness. This latter is moved along by a little handle and turning movement. A small fluorescent screen is fitted, and on looking down the fluoroscope one observes when the opacity of the silver plate and aluminium strip appear the same. The degree of hardness of the rays can then be directly read by a figure which appears in an aperture at one side of the fluoroscope. Complete with fluoroscope with fur eye shade, handle for same with protective metal plate; highly finished	3 3 0
9886	**Radiometer by Prof. Wehnelt,** consisting of an aluminium strip of gradually increasing thickness, mounted on small oblong base, with scale. Often screwed to the wooden frame of fluorescent screen permanently	0 10 0



No. 9890.

Order No.		
9890	**Radiometer by Dr. Schmidt,** to measure the penetration of the rays. With cryptoscope with fur eye shade and with removable fluorescent screen. With lead glass plate to protect the face of operator, with handle and with protective metal plate for same. Inside is fitted the skeleton of a hand	3 10 0

Bauer's Qualimeter (Patent).

A Mechanical Penetration Gauge.

The instrument is suspended from the wall of the protective house or protective screen, &c., and indicates at a glance the hardness of the focus tube on a scale. It does not depend, as in other scales, on the comparison of different tints.

This instrument, invented by Heinz Bauer of Berlin, is connected by a wire to the negative terminal of the coil or the cathode of the tube. It is a static electrometer and condenser which indicates automatically the potential of the cathode, and hence the quality of the X-rays. The apparatus consists of two wings which swing between two fixed plates. Both wings and plates are equally charged, so that a repulsion takes place between them. The intensity of this repulsion is in exact proportion to the electrical tension in the secondary circuit, and is indicated by the deviation of a pointer over a suitably divided scale.

As is well known, the penetration of the X-rays is a function of the electrical potential in the secondary circuit, so that a simple measurement of this potential between the anode and cathode will give us an indication of the hardness of the tube. The scale is gauged according to the absorption of the X-rays by sheets of lead of different thickness, increasing regularly from one-tenth of a millimeter to one millimeter.

No. 1 on the scale denotes X-rays of such a hardness as to be totally absorbed by one-tenth millimeter of lead. When the index is at No. 10 we know that the tube is giving out rays which will penetrate 0.9 millimeters of lead, but will be totally absorbed by 1 millimeter of lead.

As already explained, the instrument is unipolar, being joined up by a single wire to some point in electrical connection with the cathode. The instrument is contained in an ebonite case which swings freely from a bracket on the wall or a stand, so as to be always in a vertical position. It may be hung in the protective house or behind a suitable screen, and thus enables the operator to estimate the hardness of his tube throughout the whole of the exposure, without danger to himself.

Comparative scale of the usual instruments for measuring the hardness of tubes.

	soft				medium					hard
Bauer	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Wehnelt	1.5	3	4.5	6	7.5	9	10.5	12	13.5	15
Walter	1	1—2	2—3	3—4	4—5	5—6	6—7	7—8		
Benoist	1	2	3	4	5	6	7	8	9	10

Order No. 9900 ... ... **£7 0 0**

A very interesting article, "The Qualimeter, an instrument for measuring the hardness of a Rontgen Tube," will be found in "Archives of the Roentgen Ray" for January, 1911, a copy of which can be sent for perusal to those specially interested.

X-Ray Milli-Ammeter.

This Milli-Amperemeter is of the very best **D'Arsonval moving-coil dead-beat precision type,** such as we have described fully in the Galvanic section of this Catalogue. It is provided **with two readings,** viz., **0-5** and **0-50** m.a. On the lower reading each one-fifth part of a milli-ampere is clearly registered, while on the higher reading each division of the scale represents two milli-amperes. In all ordinary work only one or two milli-amperes are utilised through the focus tube, so that the lower reading serves admirably, while for very heavy discharges the higher reading is called into use.

Now-a-days a milli-ammeter is recognised as indispensable for all X-ray work, serving to indicate the time of exposure and also the degree of hardness of focus tube in use. Previously it was custom to content oneself with knowing the amperage passing through the primary coil, and although such knowledge of itself is indispensable, nevertheless it does not in any way take the place of accurate measurement of the actual current passing through the focus tube itself.

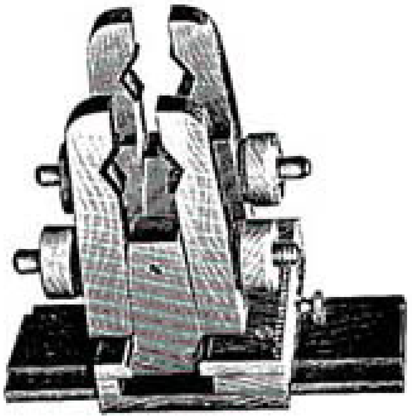
50
5
4
3
2
1
0
1
2
3
4
5
Milli-Amp.

In finely lacquered brass case, 4½ in. diameter, with ebonite knob for changing the readings. Fitted with **condenser,** as is essential for X-ray work.

These instruments are of the best type, and the finest made. Of the highest class in every respect.

Order No.	
9904	£3 5 0

Tube Holder.—Tube Shelves.



Centring Tube Holder. This new type of tube clamp is provided with two pairs of jaws, each of the four parts comprising same being independently adjustable. The cathode tube is thus held firmly in two places, and the four parts of the two jaws being independently adjustable, the tube can be set exactly as desired. The mount or base, on which are the two jaws, slides in another wooden base so that the tube can be moved along, with binding screw for fixing.

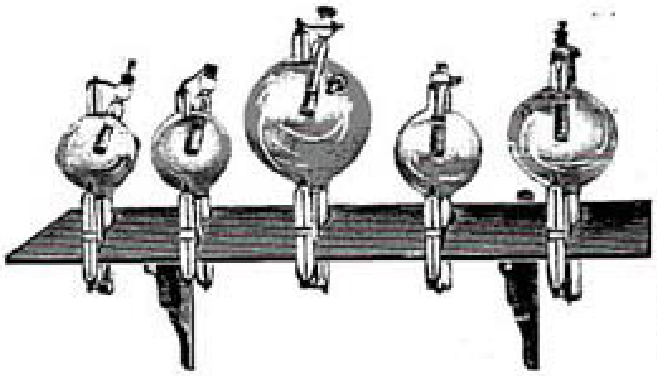
The whole, as above described, then slides in another wooden base, which is usually attached permanently to the focus tube box, &c. The whole in plain whitewood, with wooden lock rings.

Order No.		
9910	**Centring tube holder,** as described	£0 6 0
9912	**Slide base** to carry above, for fixing permanently to focus tube box, &c., and thus giving movement of the tube in two directions...	0 4 0
9914	**Centring device,** for accurately centring a tube in conjunction with the above holder. Complete with small fluorescent screen	1 15 0

Focus Tube Shelves.

An excellent method to adopt, in connection with the above tube holders, is to have a number and accurately centre a certain tube in each. When changing a tube, remove the holder from the base slide complete; thus, when re-inserted for use, each tube is properly centred.

Order No.		
9920	**Focus tube shelf,** to carry four of the special tube holders above, with tubes. Finely polished	£0 15 0
9922	**Same,** but to carry six tubes	1 0 0



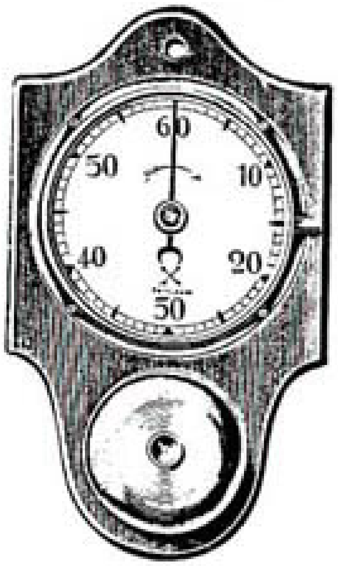
Focus tube shelf, ordinary pattern, stained and polished mahogany colour, with two polished brackets for fixing to the wall. Arranged to carry large focus tubes, and with large holes so as to allow of the bulb itself setting down into same, the edges of the holes being lined with green baize.

Order No.		
9926	For four tubes	£0 17 6
9928	For six tubes...	1 0 0

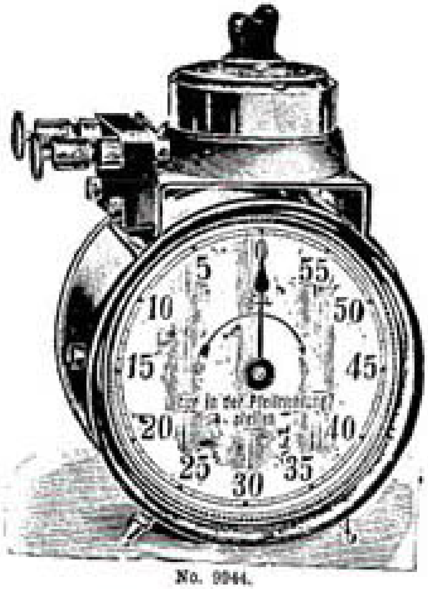
Total length about 5 feet 6 inches.

Other sizes and patterns to order. Also Focus Tube Cabinets, &c.

Exposure Clocks.



No. 9942.



No. 9944.

Order No.		
9940.	**Minute clock**, indicating to 5 minutes, with dial engraved with 5 second divisions, with press knob for winding. Bell strikes at 3, 4, or 5 minutes. Similar pattern to No. 9942 but smaller ...	£0 9 0
9942.	**Alarm clock**, indicating up to 60 minutes by minutes. A loud alarm rings when hand reaches the time set. With winding key, &c. Mounted on polished wood board. (Fig.)	0 18 0
9944.	**Alarm clock**, by Dr. Gocht, with automatic switch. A loud alarm rings and the switch automatically switches off the current at the time set. Terminals are provided for connecting the automatic switch of the clock in the primary circuit. (Fig.)	1 1 0
9946.	**Stop watch**, indicating up to 60 minutes, with both seconds and minutes hands	1 3 0

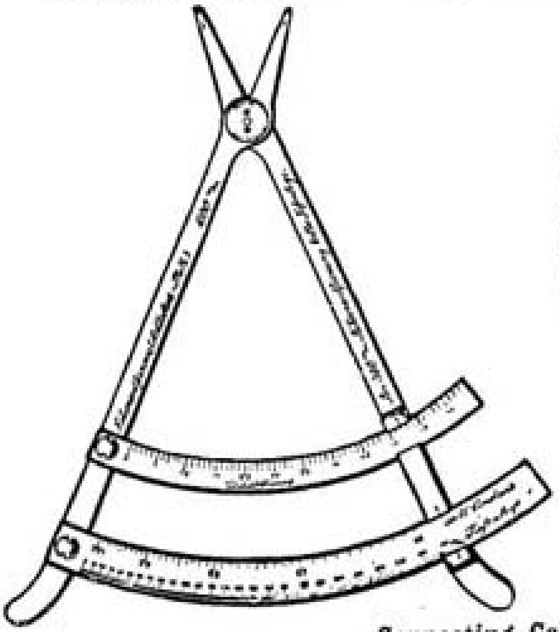
9950.	**Foot-switch**, enabling the focus tube to be switched on and off by the operator's foot while standing by the side of the patient, as when making a screen examination on the couch, &c. Consisting of a polished wood base on which is mounted a powerful knife or chopper pattern switch, with another board above on which the foot is placed. With a powerful spring to break contact immediately the pressure of the foot is released. The switch is, of course, wired into the primary circuit	1 15 0

If desired, the same foot-switch can also be made to switch on and off one or more incandescent lamps used for illuminating the room simultaneously, so that immediately the X-rays are switched off the room is lighted, and vice versa.

X-Ray Depth Gauge.

By Dr. Furstenau.

For the Localisation of Foreign Bodies, Bullets, Concretions, &c.



The X-Ray Depth Gauge of Dr. Furstenau renders it possible to obtain exact localisation of foreign bodies, &c., both with the fluorescent screen and with radiographs, in the most simple manner.

The depth can be read off directly. No occasion to shift patient or plate.

Order No.		
9960.	Complete in case	£2 8 0

Connecting Cables.

High tension cables, for connecting spark coil with focus tube. Heavily insulated with solid rubber about a quarter of an inch in diameter, black cotton braided outside with brass terminal ends.

Order No.			
9970.	5 ft. long	per pair	£0 9 0
9972.	10 ft. long.	,,	0 18 0

Spring tapes, for connecting from spark coil to focus tube. These offer the advantage of always remaining taut, obviating liability of sparking through the tube and risk of shocks through coming in contact with loose hanging cables. They are of the same pattern as the ordinary spring tape except that they are fitted with a special gold braided tape instead of the usual steel ribbon, which is not flexible enough for the purpose. They are fitted with a stem to go into the terminal of coil and with a hook to attach to focus tube.

Order No.			
9980	Gold braided tape, length 6 ft.	per pair	£0 12 0
9982	Gold braided tape, length 10 ft.	,,	0 17 6

Set of flexible cables, with metal terminals, for connecting up together the various appliances comprising an outfit, viz., the coil, condenser, interrupter, interrupter-motor, switchboard.

Order No.		
9990	Consisting of 4 twin cables, 2 about 4 yds. long and 2 about 3 yards long, the former pair to connect from switchboard to coil and condenser, and the latter pair from switchboard to interrupter and motor ... ... per set	£0 15 0

Alternating to Continuous Current Motor Transformers.

An X-ray outfit cannot be efficiently operated direct from an alternating current main. It is true that an electrolytic interrupter or a synchronous mercury interrupter can be worked from such a main, but the results are very indifferent, and an outfit so operated cannot provide results bearing any relationship to a modern outfit working from continuous current.

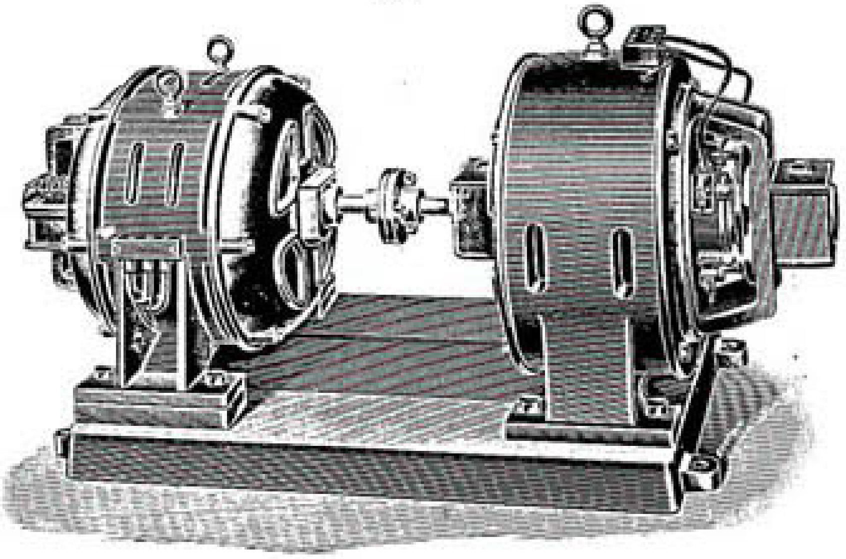
Various devices taking the form of rectifiers, &c., have been adopted in days gone by, but under the best of circumstances the results were very poor, and they are quite out of question when it comes to working a large modern coil from which the best results are desired. For our own part we have always maintained the advantages of the motor transformer, and have never recommended the use of any form of rectifier. Just recently we have replaced many of these rectifiers by motor transformers in order to bring the respective outfits more into line with modern conditions.

Therefore, if only alternating current is available it must be transformed to continuous current by means of a motor transformer.

Such transformer sets are very efficient and reliable if they are specially constructed for their work, but we advise the doctor to be very careful if purchasing an ordinary commercial motor transformer, because they are not insulated to withstand the back high tension current, and in consequence they invariably break down. Especially is this the case when working with large coils such as are nowadays invariably taken. As with most other things, there are special conditions to be met, and such conditions and how to meet them can only be learned by actual experience. We have supplied a very considerable number of these motor transformer sets, and in no case has one broken down. On the other hand they have given every satisfaction, as their owners would always be pleased to testify.

A transformer set consists essentially of a motor running from the alternating current main and direct coupled to a continuous current dynamo, the two machines being mounted together on a cast-iron base plate.

On account of the varying alternating currents and on account of the different requirements in regard to size of coil and classes of work, it is not possible to standardise any particular transformer set. We shall always be pleased to submit estimates and to advise according to the conditions of each installation, and the prices listed are merely to serve as a general guide as to cost.

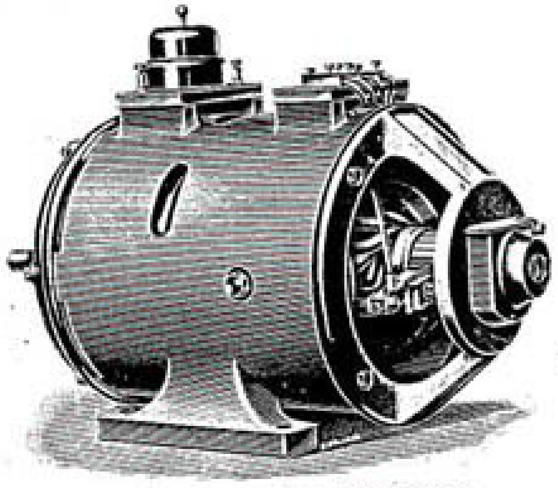


Alternating Current to Continuous Current Motor Transformer, consisting of an alternating current motor direct-coupled to a continuous current dynamo, the two machines mounted together on cast-iron base plate.

To work a spark coil with the centrifugal motor mercury break.

If dynamo giving an output of 1,000 watts, say 100 volts 10 amperes ...	£33	0	0
If dynamo giving an output of 2,000 watts, say 100 volts 20 amperes ...	45	0	0

These prices serve as a guide. We shall be pleased to submit estimate with specification on learning the voltage and periodicity of the alternating main, and if one, two or three phase. We will submit alternatives for different outputs from dynamo, according to circumstances. *See pages 233 and 234 for further remarks of importance.*



SMALL SPECIAL TYPE TRANSFORMER
for charging Accumulators.

This set consists of a **Motor Wound for Alternating Current and mounted in the same frame with a Continuous Current Dynamo.** The motor can be wound for any voltage and periodicity, single, 2 or 3 phase, and the Dynamo has an output of 100 watts, the standard winding for which is 15 volts, 6 to 7 amperes.

This Transformer has been designed to enable those supplied by alternating current mains to obtain a continuous current supply to charge accumulators. The dimensions of the machine are as follow:—

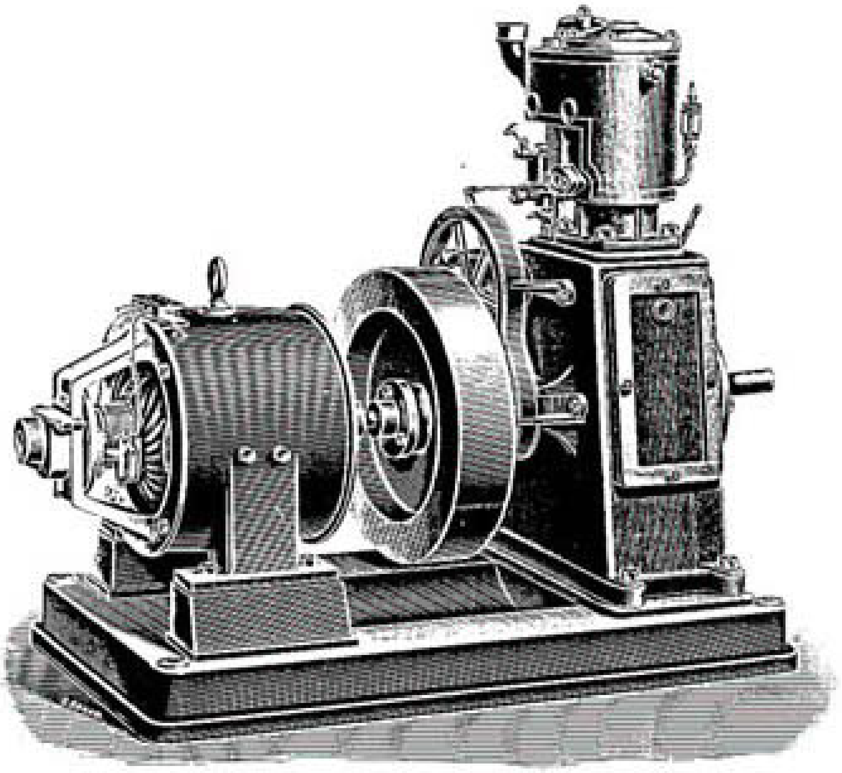
Length 15 in. Height 13 in. Width 11 in. Weight 72 lbs.

Complete with Starter	£15	0	0

A new machine that has proved really useful and efficient

Generator Sets.

These Generator Sets, consisting of spirit engine direct coupled to a dynamo, have recently been brought to great perfection with the rapid development of internal combustion engines in other directions. They are very suitable and convenient for generating a supply of continuous current for working X-ray outfits or any other electro-medical appliances, as also for lighting and all other purposes. They are easily managed, require but little attention, are economical in running expense and in maintenance, and are reliable.



The price varies according to size. We shall always be pleased to submit estimate and detailed specification on learning requirements, and will advise according to requirements and special conditions.

A set, as illustrated above, with a 2 h.-p. vertical type engine, mounted on cast-iron base and coupled to a dynamo giving an output of about 1,000 watts, say 50 volts 20 amperes or 100 volts 10 amperes, complete with tanks, magneto, &c., costs about **£60 0 0.** A larger set, capable of giving about 2,000 watts, works out about **£85 0 0.**

The dynamos are shunt wound. If used for accumulator charging, a smaller set can be taken ; see remarks on next page.

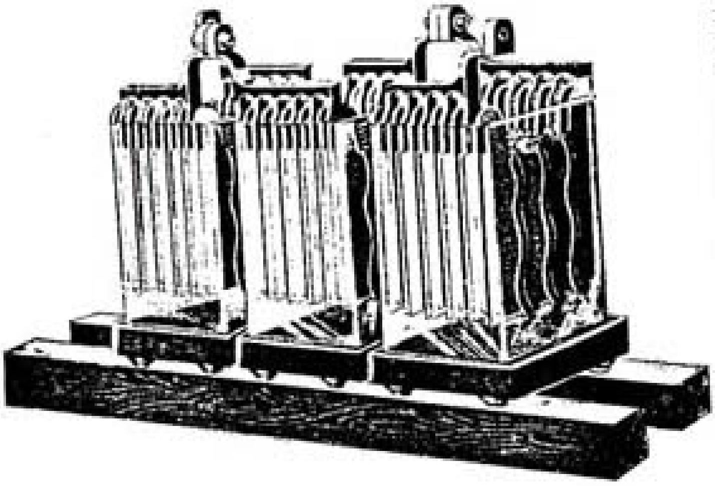
Accumulators.

On preceding pages we have listed Motor Transformers for transforming alternating current to continuous current for the purpose of working an X-ray outfit or other such electro-medical appliances. Also, we have listed Generator Sets for generating continuous current where no electric supply whatever is available.

In either case it is possible to work the apparatus direct from the dynamo, or the dynamo can be used for charging accumulators and the apparatus thus worked from same. If a heavy current be required for working a large X-ray coil, &c., as for very rapid radiography, it follows that the dynamo must be capable of giving such current if it be intended to work direct from the dynamo. On the other hand, if a set of accumulators are adopted, they can be charged with a lower amperage from a smaller dynamo. They store up the energy put into them and give it out at any amperage desired, so that one is enabled to take a greater amperage out of them for short periods, as with rapid radiography, than the charging dynamo itself could give.

The saving in the cost of the motor transformer or generator set goes some considerable way towards covering the cost of the accumulators. At the same time there are certain advantages on the side of the accumulators which are of much importance. A dynamo really requires to run at a more or less steady load, which may be increased or reduced to meet the requirements of the work, but they are not able to stand a heavy amperage suddenly demanded as in instantaneous or very rapid radiography. The dynamo must always be running when current is wanted if accumulators are not employed, whereas with accumulators in use they can be charged at all times convenient, and during charging the dynamo can be left running for hours at a steady output, conducing to easy running, long life and efficiency.

We have just executed an order for one of the leading radiographers consisting of a motor transformer to transform his alternating main to 120 volts 10 amperes continuous current, with which he is charging a set of 40 large capacity open type accumulators of 180 ampere-hours. These accumulators will maintain a steady output of 18 amperes for 10 hours or 9 amperes for 20 hours and so on. They are also capable of giving from 30 to 40 amperes for a few seconds as required for rapid radiography with a 16 in. intensified spark coil, running with our centrifugal mercury interrupter.

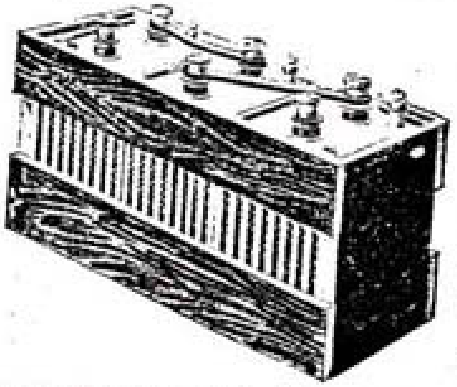


Central station open type accumulators, with glass cells, capable of giving a discharge of 18 amperes for 10 hours, or smaller amperage for correspondingly greater time. The usual amperage required for X-ray work can be taken as between 6–12. They are also capable of giving from 40 to 50 amperes for short periods for rapid exposures. Complete with insulators, indiarubber discs, sheet glass covers and wooden stands, &c. Each cell measuring approximately 7 in. × 13 in. × 22 in. high over all.

Price per cell, about **£1 5 0**

We shall always be glad to submit detailed estimates for cells of any capacity complete with wooden stands to suit, ready for erection.

Accumulators.



The enclosed type of accumulator, as illustrated, is the one that has been most generally in use in the past. It is quite satisfactory for working an ordinary X-ray outfit with moderate currents for "time" exposures, but is not capable of giving very heavy amperage as in the case of those described on previous page. They are convenient for working portable outfits inasmuch as the open type cannot be taken about, but require to be erected permanently. Usually 2–12 volts sets are taken for working an ordinary outfit, but much better results are secured if four such sets are used, making a total of 48 volts. We recommend cells of large capacity, say 60 ampere-hours, and do not consider anything smaller as satisfactory. They are not able to give sufficient output and exhaust far too quickly.

Prices.

Accumulator, 6 cells (12 volts). Sealed celluloid cells, with plates of the highest class, capable of giving a heavy amperage without buckling. Contained in polished wood crate with handles. The celluloid cells are naturally a little more expensive than glass ones, but are much better and obviate risk of breakage.

Actual (not ignition—which is double) capacity 60 ampere-hours.

Order No.		
9994	... ...	£6 0 0
9996	Same, but mounted up in highly polished wood box, with handles, instead of polished wood crate	6 10 0

Charging Arrangements.

When a large installation of accumulators is erected, which are to be charged from a motor transformer or a generator set, it is necessary that some provision be made for the proper carrying out of this operation. If one of our usual X-ray switchboards is taken at the same time, the crank rheostat on the board can be used to control the amperage with which the accumulators are charged, the same amperemeter measuring this current. A slight addition would be made to the board and separate charging terminals provided, so that the operation is simple and unnecessary expense avoided.

In some part of the circuit an automatic cut-out should be added, the purpose of which is to instantly switch off the current should the voltage of the accumulators exceed that of the dynamo, and thus preventing them from discharging back into the dynamo. This can happen should the dynamo slow up or stop for any reason, such as the failure of the main current, &c.

In the absence of a suitable switchboard, a special charging board becomes necessary.

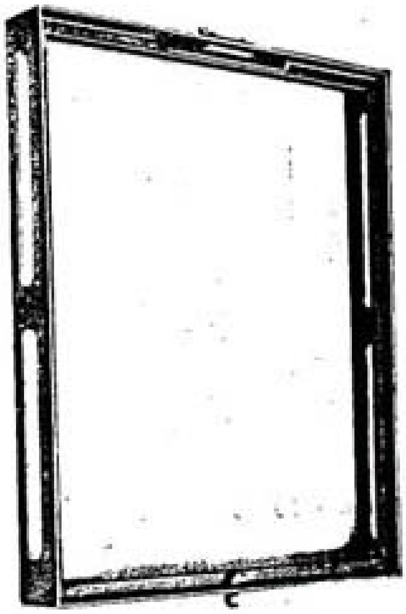
Full details and prices will be furnished according to the conditions of each outfit.

Scott's Plate-Holder for Wet Negatives.

Negative

Firmly

Secured.



Spoiled

Plates

Avoided.

There is no Radiologist who does not deplore the fate of his negatives when they leave his hands, especially when they are wanted urgently by the Surgeon, even before they are dry.

Not only is the film of the plate spoiled in transit, but it is often pencilled, scratched and sometimes dropped.

This is common to all Radiologists, and has been overcome by the employment of a very simple, neat and cheap device designed by Dr. Scott.

The device consists of a metal frame made in all sizes from ¼-plate to 24 by 20 inches, also in Continental sizes. The framework is made of zinc, for which special tools have been made to bend it to the right profile, and it is protected by a special varnish.

Inserted in the frame is a sheet of frosted glass held in position by a spring. For Gaslight illumination, opal glass may be had. The opposite side is left for the wet plate, which is inserted, with the film inwards, by simply pulling the spring clip. The plate may now be handled in any way without the film being damaged and without preventing it from drying. A current of air is allowed to circulate between the frosted glass and the film. It may be handled in daylight or gaslight.

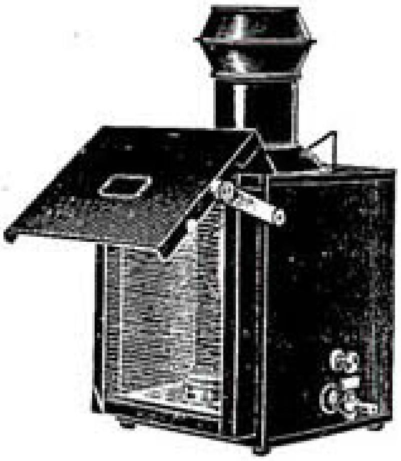
This practical method is sure to find its place in every Radiological Laboratory.

Prices.

Order No.				s.	d.
9998	English sizes.				
A	¼-Plate ...	...	each	3	6
B	½-Plate ...	...	,,	4	0
C	1/1 Plate...	...	,,	4	6
D	10 by 8 inches ...		,,	5	0
E	12 by 10 ,,	...	,,	5	6
F	15 by 12 ,,	...	,,	6	6
G	20 by 16 ,,	...	,,	7	6
H	24 by 20 ,,	...	,,	8	6

Order No.				s.	d.
9999	Continental sizes.				
A	9 by 12 c/m.	...	each	3	9
B	13 by 18 c/m.	...	,,	4	3
C	18 by 24 c/m.	...	,,	4	9
D	21 by 27 c/m.	...	,,	5	3
E	24 by 30 c/m.	...	,,	5	6
F	30 by 40 c/m.	...	,,	6	6
G	40 by 50 c/m.	...	,,	7	6
H	50 by 60 c/m.	...	,,	8	6

Radiographic Accessories.

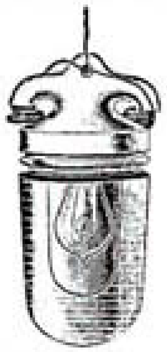


Bichrome Lantern. This lantern is fitted with a good paraffin lamp adjustable from the outside, and the larger size has also a burner and tap for ordinary gas if required. In the front is fitted a trough containing a solution of bichromate with certain carefully selected proportions of aniline dyes. The trough is provided with a cover and hole for emptying and refilling, and the lamp can be carried without fear of spilling the liquid. It gives an excellent light in which all ordinary plates can be safely developed, but we recommend that the lamp be placed on an overhanging shelf, so that the plate may be kept in the shadow of this during the early stages of development.

The lamp is well ventilated and the liquid helps to keep it cool, thereby adding further to the comfort of the room.

Order No.			Order No.		
10009	Complete, 10 by 8,	£1 10 0	10010	Smaller, 8 by 5,	£1 2 6

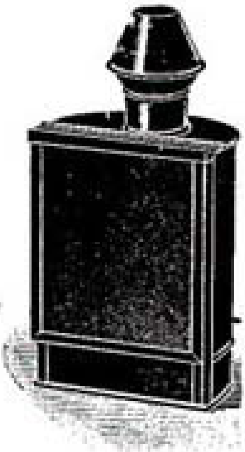
Electric Bichrome Lamp.



This is a neat and convenient lamp, designed for suspension from ceiling or shelf. An electric incandescent lamp inside is provided with a glass cover, and in between this and the larger outer cover is placed the solution. Complete with length of flexible cable with plug, and an 8 c.p. lamp.

Order No.		
10020	... ...	£1 1 0

10040	**Electric Incandescent Lamp** of heavy ruby glass, 16 c.p., bayonet pattern	£0 5 0
10050	**Same,** but of screw pattern, not bayonet	0 5 0
10060	Clear Electric Lamp, tubular pattern, over which screws a cover glass of heavy ruby. To fit usual bayonet lamp-holder	0 7 6
10070	Same, but to fit screw pattern lamp-holder	0 7 6

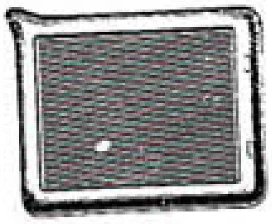


Oil Lanterns.

Order No.		
10090	Half-round lamp, ruby glass front, well ventilated, wick raised from outside. Giving a good light (Fig.)	£0 3 0
10100	Triangular lamp, best quality, with one orange and one ruby glass. Light can be adjusted from outside. With light-tight flaps	0 7 0
	"Reliance" lamp, with two ruby and one orange glasses, ground on the inside. Burner adjustable from outside, and chimneyless	
10110	Size of glass windows 6½ by 3 ...	0 4 6
10120	Size of glass windows 7½ by 3½ ...	0 6 0

Any pattern of dark room lamp can be supplied to meet special conditions, such as space and arrangement of room, etc.

Radiographic Accessories.



Granitine Dishes.—These dishes are superior in every way to the old ones made of common earthenware. They are made of a special semi-vitreous body, and covered with a hard porcelain glaze. They may be used for all photographic chemicals indiscriminately, and can be kept scrupulously clean.

Order No. 10150	A	B	C	D	E
To take plates ...	6½ × 4¾	8½ × 6½	10 × 8	12 × 10	15 × 12
	s. d.	s. d.	s. d.	s. d.	s. d.
Deep	1 0	1 5	1 8	2 9	6 0
Shallow	0 10	1 2	1 5	2 3	5 0

The deep dishes are invariably taken.

Printing Frames.

Box Pattern Printing Frames, with plate glass fronts, springs and hinged pressure boards. The print may be inspected without disturbing its position. This type are best for radiographic purposes, as there is less liability of breaking the large plates used. Made in best pine, dovetailed, mitred and clamped, and of highest quality.

Order No. 10180		s. d.		s. d.
A	8½ × 6½ ...	8 6	Felt Pads, extra	0 8
B	10 × 8 ...	9 6	" "	0 9
C	12 × 10 ...	12 0	" "	1 0
D	15 × 12 ...	17 0	" "	2 0

Jaynay Patent Non-Slipping Printing Frames, usual flat type, with hinged back so that picture can be examined without disturbing its position. Pegs on the hinges fit into grooves cut in the frame, so that the back board cannot slip. With stout brass springs, well and strongly made.

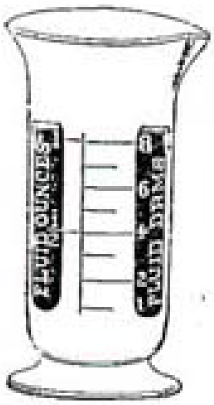
Order No. 10200	A	B	C	D	E
	6½ × 4¾	8½ × 6½	10 × 8	12 × 10	15 × 12
	1s. 0d.	2s. 0d.	3s. 6d.	4s. 6d.	6s. 6d.

Stoppered Bottles,

With a plain white matt badge upon which any name can be written with ordinary lead pencil. The name can be removed with a damp sponge, or if required permanently the badge should be covered with negative varnish after writing.

Prices per dozen—Wide mouth, stoppered. Order No. 10240		s. d.	Narrow mouth, stoppered.	s. d.
A ...	2 oz.	4 0	G ...	3 6
B ...	4 oz.	4 6	H ...	4 0
C ...	8 oz.	5 6	I ...	5 0
D ...	10 oz.	6 0	J ...	5 6
E ...	16 oz.	8 0	K ...	7 6
F ...	20 oz.	9 0	L ...	8 6

Radiographic Accessories.



Measure Glasses. These are of superior quality white glass, with transparent letters through a white ground. Accurately graduated. Either Conical or Cylindrical shape. The latter, as illustrated, is generally preferred, and will be supplied unless otherwise ordered.

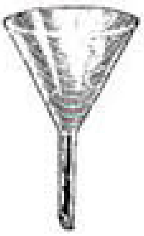
Order No. 10280.	A	B	C	D	E	F	G
	1 dr.	2 dr.	½	1	2	4	6 oz.
	4d.	4d.	4d.	4d.	5d.	6d.	8d.
	H	I	J	K	L	M	
	8	10	16	20	32	40 oz.	
	9d.	9d.	1s. 0d.	1s. 2d.	1s. 9d.	2s. 6d.	

Combined Measure Glasses, provided with a double scale, one side usual and the other side of scale cubic centimetres.

Order No. 10300	A	B	C	D	E	F
	1	2	4	10	20	40 oz.
	25	50	100	250	500	1000 ccm.
	7d.	8d.	1s. 0d.	1s. 6d.	2s. 0d.	3s. 6d.

Glass Funnels, fluted.

Order No. 10350	A	B	C	D	E	F	G
	Diam. 2	3	4	5	6	7	8 inches.
	Each 3d.	4d.	5d.	6d.	7d.	9d.	1s. 3d.



Chemicals.

The following chemicals are required for making up the developer and fixer as recommended by Ilford for their X-ray Plates. For formula see Page 239. We ourselves, and many workers we know, always work to this formula, and are very strongly convinced in its favour.

Metol (Agfa brand), Powder in bottles, 1 oz., 2s. 6d.; 4 oz., 9s. 6d.;
8 oz., 19s. 0d.; 16 oz., 38s.
Hydroquinone " " " 1 oz., 8d.; 16 oz., 7s. 0d.
Sodium Carbonate, re-cryst., 1 lb. in bottle, 8d.
Sodium Sulphite, re-cryst., 1 lb. in bottle, 8d. 7 lb. jars, 3s. 11d.
(1 lb. packet 6d., 7 lbs. 2s. 11d.)
Pot. Bromide. In bottle. 1 oz. 3d., per lb. 2s. 0d.

Hyposulphite, finest granulated. 1 lb. 2d., 7 lbs., 1s. 0d., 28 lbs. 3s. 3d.
Pot. Meta-Bisulphite. In bottle. 1 oz. 3d., per lb. 2s. 0d.

Any description of photographic apparatus, chemicals, etc., supplied at usual prices.

Ilford X-Ray Plates.

These plates are now universally in use and afford the greatest satisfaction. They are extremely sensitive to X-rays, provide excellent definition and detail, and are uniformly reliable.

Prices per Dozen.

	Ordinary Packing		Packed in Double Envelopes		Packed in Double Wrappers	
Inches	Per dozen in dozens		Per dozen in dozens		Per dozen in dozens	
	s.	d.	s.	d.	s.	d.
6½ × 4¾	4	6	5	9	4	8
Inches	Per dozen in dozens or 6 plates in a box to order		Per dozen in dozens or 6 plates in a box to order		Per dozen in dozens or 6 plates in a box to order	
	s.	d.	s.	d.	s.	d.
8½ × 6½	7	6	9	0	8	6
Inches	Per dozen in ½ dozens or 4 plates in a box to order		Per dozen in ½ dozens or 4 plates in a box to order		Per dozen in ½ dozens or 4 plates in a box to order	
	s.	d.	s.	d.	s.	d.
10 × 8	12	6	15	6	13	6
12 × 10	17	6	21	6	20	0
15 × 12	30	0	36	0	33	0

Continental Sizes.

Ordinary Packing.

Centimeters	Per dozen		Centimeters	Per dozen	
	s.	d.		s.	d.
13 × 18	5	0	30 × 40	34	0
18 × 24	9	3	40 × 50	62	0
21 × 27	14	0	50 × 60	100	0
24 × 30	17	0			

Ilford X-Ray Films.

Inches		Per dozen	
		s.	d.
1⅝ × 1	specially wrapped for dental work	2	0
1½ × 1	" " "	2	0
1⅝ × 1⅝	" " "	2	0

Ordinary Packing.

Inches	Per dozen		Inches	Per dozen	
	s.	d.		s.	d.
4¼ × 3¼	3	0	10 × 8	17	0
5 × 4	4	3	12 × 10	23	6
6½ × 4¾	6	0	15 × 12	37	6
8½ × 6½	10	0			

Envelopes or Wrappers extra.

Development.

The following developer is recommended—

Metol	1 gramme	20 grains
Hydroquinone	4 grammes	80 "
Sodium sulphite (cryst.)	50 "	2 ounces
Sodium carbonate "	50 "	2 "
10 per cent. solution of potassium bromide	4 c.c.	80 minims
Water	500 "	20 ounces

Fixing.

Wash thoroughly and fix in—

Hypo	400 grammes	1 lb.
Water	1,000 c.c.	40 ounces
Potass. metabisulphite	25 grammes	1 ounce

High Frequency Currents.

A high frequency apparatus is worked by means of the same spark coil, interrupter and switchboard as are used for X-rays, so that anyone already possessed of an X-ray outfit can obtain high frequency currents with very little trouble and expense. It is only necessary to add a high frequency transformer, a couch for auto-condensation, if desired, and perhaps one or two electrodes. The cables leading from the spark coil are connected to the spark gap of the high frequency apparatus instead of being connected to the focus tube as when X-rays are wanted, the working of the outfit and regulations being carried out in exactly the same manner as for X-ray work.

The high frequency current is an alternating current of very great frequency; in fact, it is on account of its remarkable rapidity of alternation that it has received its name. Considering that the alternation occurs with a rapidity of some millions per second, it is certainly entitled to its name. When first the treatment was taken up some few years back it received much attention and was very largely adopted. It was utilised for the treatment of all classes of complaints, and, apparently on account of its wonderful nature, it was considered or expected to be almost a cure-all. In consequence of such impossible expectations remaining unfulfilled, the currents came into disfavour for a time, but, now that the value of the current is better known, there can be no doubt that very good results are being secured in suitable cases. A considerable amount of literature has since appeared respecting the uses and advantages of the high frequency currents, and anyone interested will find that such literature covers almost, if not entirely, the whole field.

The high frequency currents are usually administered by one of four methods, viz.: Auto-condensation, Auto-conduction, Effluve, or by Direct Application.

Auto-condensation.—This is a full body method universally in use throughout the world and providing excellent results. The patient reclines comfortably upon a thick horse-hair cushion placed upon an Austrian bentwood couch. Beneath the cushion is placed a metal plate which is connected to one pole from the high frequency transformer. The other pole may be connected to a metal handle fixed on one or both arms of the couch and which the patient holds in his hand, or it may be connected to a convenient metal or vacuum electrode and given to the patient's hand in that way.

Under these conditions the patient's body is in the same relation as one coating of a Leyden jar, the other coating consisting of the metal plate beneath the cushion and the cushion itself the insulating medium between the two. As the impulses of current go from the transformer so an induction takes place between the patient's body and the metal plate, and in this manner the whole of the body comes under the influence of the current.

If a good thick cushion is utilised the patient does not feel any sensation whatever during the application of the current. If a thin inferior cushion be used the current might spark through from the metal plate, with a consequent unpleasant shock for the patient. This method is therefore very simple and convenient to both patient and doctor, and the patient's comfort is further secured because there is no occasion to remove any part of the clothing.

Auto-conduction.—In this method the patient is placed inside a large solenoid or cage consisting of a stout copper wire and the patient may either sit or stand within it. Both poles are then connected to the copper wire, the one at the top and the other at the bottom, the current thus travelling completely round the patient. Although not in contact with the cage at any part, the current discharges itself from all sides into the body of the patient, thus constituting a full body treatment. In this case also there is no occasion to remove the clothing. To prove the quantity of current inside the solenoid an incandescent lamp can be placed inside, and although not connected to the solenoid in any way the lamp will glow, and this is also the case if held by the patient in his hand.

This system is not very generally adopted in this country, although generally used and favourably regarded in America.

Effluve.—The treatment by effluve or brush discharge by means of electrodes is only monopolar and is used for local application. The electrode is usually one with a number of metal points or a number of bundles of tinsel wire or anything of the same kind. Vacuum electrodes will also give off a brush discharge, but it is of shorter length than the effluve from multiple point electrodes. To such electrodes one pole of the high frequency transformer is connected and the treatment consists merely in the spraying of the part with the brush discharge or shower of sparks. Under ordinary conditions the effluve is only just to be felt by the patient, but it may on the one hand be made so weak or soft as to be inappreciable, or on the other hand it can be so increased in strength that if the part be placed close to the electrode, that is to say within 2 in. or so, strong muscular contractions are originated. If the part be brought too close to the electrode the current will jump across in the form of a thick spark which, although harmless, is decidedly painful for the patient. Local treatment on these lines is also administered with the patient on the condensation couch and with the second pole connected to the plate. Thus there is effected a form of full body treatment at the same time as localising the currents to a certain definite area.

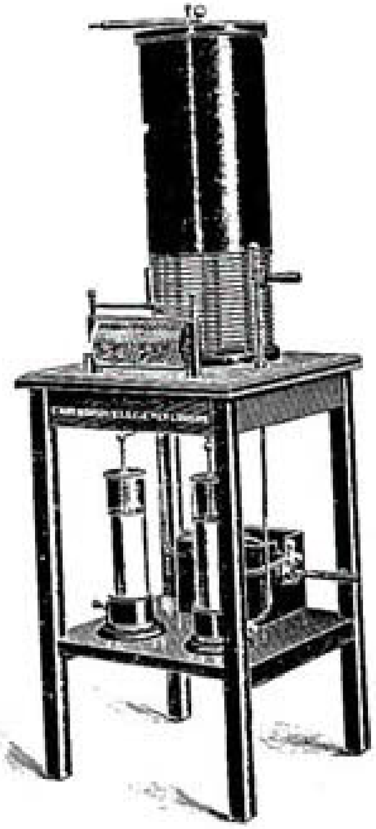
Direct Application.—As would be inferred from its name, this method consists in the direct application of the electrodes to the body. Usually glass electrodes are adopted, either vacuum or filled with water, and of course of special shape and size to suit various parts of the body. Excellent results have been obtained in hemorrhoidal cases by the application of a suitable vacuum or water cooled glass electrode. Smaller electrodes are made for treatment of other cavities such as the ears, nose, &c., and hammer shaped electrodes for administration to a patch of skin disease or any part of the body.

As mentioned under Effluve a brush discharge is also obtained from the glass vacuum electrodes, but of shorter length. If approached too near to the body the current will jump across as a thick spark which is painful, otherwise vacuum electrodes are frequently used in giving effluve treatment. The electrodes filled with water or spirit reduce the strength of the current and prevent it from discharging itself as a spark and they are therefore particularly suitable for internal use. To overcome the sparking the vacuum electrodes should be kept a certain distance from the body when treating by a brush, or otherwise should be placed on the body before switching the current on. A considerable amount of heat is generated by the vacuum electrodes which does not occur with the electrodes filled with water. Electrodes of metal are occasionally used in certain cases.

When an electrode is being used with one pole it is sometimes an advantage to connect the other pole of the transformer to earth by means of a metal rod driven some feet into the earth or by using gas pipes or water pipes when suitable. This earthing of the other pole greatly improves the length and amount of the brush discharge.

High frequency transformers have been made in a great variety of patterns, and many of them have been run up to a great cost. They are, however, all constructed on the same principles, having a spark gap, two Leyden jars or else plate condensers, a small solenoid and a resonator. No matter in what pattern they are made, the therapeutic effects of the current are the same, since they are peculiar to the current itself and are not materially affected by the form of apparatus. It is, therefore, only a question of constructing an apparatus which shall give a good output, but otherwise to keep same to the simplest and most convenient form possible. The smooth working of the transformer and the quality of its output depend upon accurate harmony between the leyden jars, the solenoid and the resonator, of course taking into consideration the strength of current passing through the spark coil. Our own standard pattern transformer as listed is always carefully tuned up to the conditions under which it will have to work, and, therefore, the very best results are assured. We can supply high frequency transformers of any pattern whatsoever, and at the usual prices, but none of them provide better results than our own model, or, of course, they would have been adopted as our standard.

High Frequency Transformer.



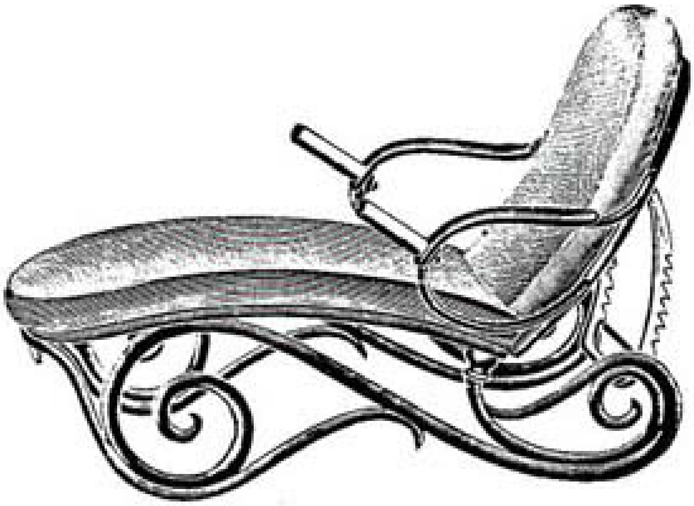
High frequency transformer, standard model. Mounted up on finely polished oakwood table on castors. With two Leyden jars provided with round polished wood bases, with contact springs and ebonite tops. With best pattern spark gap of large size, and dividing in halves for convenience in drying and cleaning. The drying and cleaning of the spark gap is the only attention demanded by a high frequency transformer, and is essential for smooth and efficient working. The adjustable rod is given a coarse thread for quick regulation of the spark distance. Spark gap supported in a wooden cradle or base, and the two halves are pressed tightly together by means of massive ebonite lock rings screwing up against the wooden support. The end mounts of the spark gap are of ebonite.

On top of the table is mounted a small solenoid and a large resonator, the upper part of the latter being covered in with a polished ebonite sheet. Both solenoid and resonator have adjustable spring contacts, and by using the one in conjunction with the other most perfect regulation is secured in the most simple manner between extremes.

The transformer is simple, but absolutely efficient for all forms of treatment. Well designed and constructed throughout, and of highest finish. No transformer can provide a better current, the current intensity being very great and the effluve of great length and yet soft.

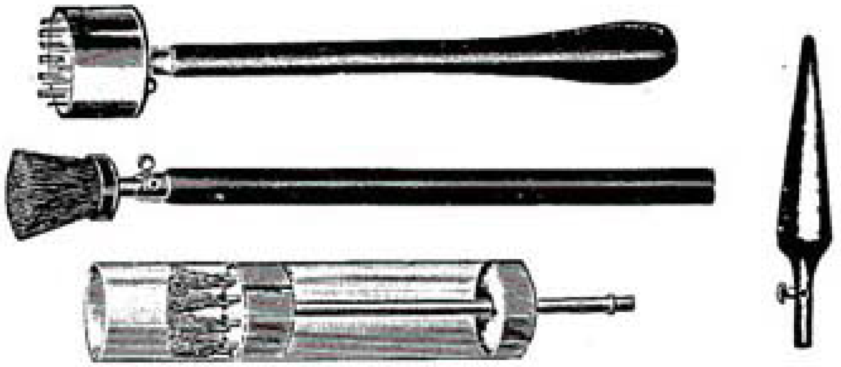
Order No.
10500 ... ... £12 0 0

High Frequency Currents.



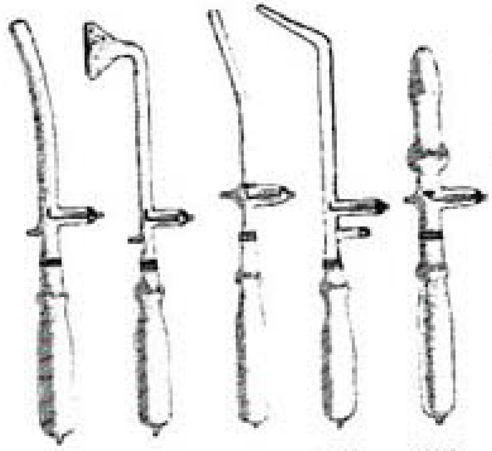
Auto-condensation Couch, for full body treatment. Of best Austrian bentwood, with adjustable back rest. With best quality hair cushion, some three inches thick, and covered with cretonne. The metal plate is fitted beneath the cushion with connecting terminal. The arms are fitted with two nickel plated handles, which are both connected to one terminal arranged at the back of the couch. The whole of best class.

Order No.		
10550	Cushion covered cretonne, as described	£7 10 0
10560	With cushion covered in best leather cloth	9 0 0



Order No.		
10600	Multiple point electrode for effluve. Finely plated, and made to screw on handle below	£0 10 0
10620	Tinsel wire brush electrode for effluve. Made to screw on handle below...	0 10 0
10640	Tinsel wire brush electrode sliding in a glass cylinder, for effluve, and also suitable for ozone inhalation. Made to screw on handle below	0 17 6
10660	Conical metal electrode, finely rounded and plated. For treatment of hæmorrhoids, &c. Made to screw on handle below...	0 10 6
10680	Finely polished solid ebonite handle, threaded to carry any of the above electrodes	0 8 0

High Frequency Currents.



High Frequency Electrodes of glass, with glass handles. No. 10800, about ¾ in. diam., for rectum, &c.; No. 10804, about 1¾ in. diam., for effluve and for direct local application; Nos. 10806 and 10808 for nose, ears, &c., and No. 10812 for vagina and rectum. Shapes as illustrated.

Vacuum ... ... each £0 5 6

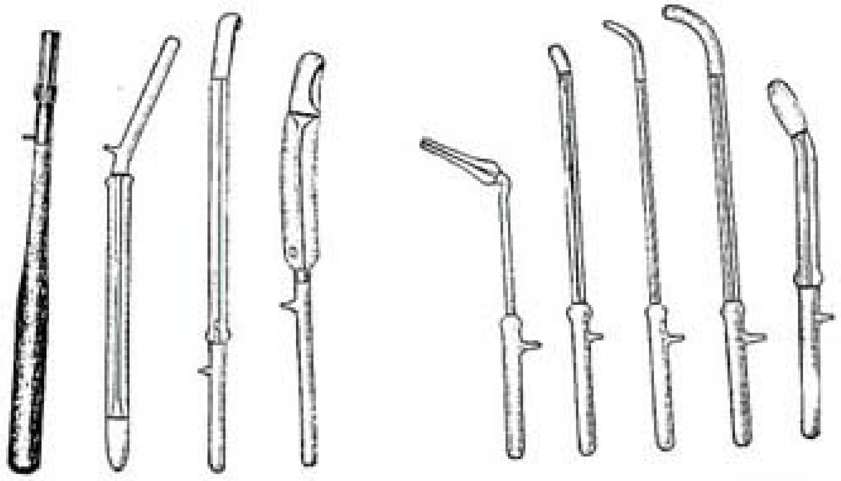
Order Nos. 10800A, 10804A, 10806A, 10808A, 10812A, same as above, but filled with water or spirit (see remarks, page 242) ... ... each £0 5 6

Order Nos. 10800B, 10804B, 10806B, 10808B, 10812B, same shapes as above, but without glass handles. Instead they are finished off with an ebonite mount with metal pin to fit handle below ... ... each £0 7 0

Order Nos. 10800C, 10804C, 10806C, 10808C, 10812C, same, but filled with water or spirit (see remarks, page 242) ... ... each £0 7 0

Order No. 10840. Finely polished solid ebonite handle, arranged to carry the above electrodes £0 10 0

Any of these electrodes can be made to shape and sizes required.



Insulated Glass Electrodes.—These electrodes have insulated shafts, that is to say, the current does not discharge through the shafts, but is conducted by means of the internal tube to the vacuum contact part at the end.

Order No.				
10880	For treatment of rectum	£0	6	6
10884	" " prostate	0	6	6
10888	" " vagina, &c.	0	6	6
10892	" " the ears, &c.	0	5	6
10896	" " the nose, &c.	0	5	6
10900	" " "	0	5	6
10904	" " the throat, &c.	0	5	6
10908	" " the tongue and tonsils, &c.	0	6	6
10950	**Polished Wooden Handle**, with brass holder and ring, for carrying the above electrodes	0	2	0

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